THE GEOGRAPHICAL JOURNAL

VOLUME LXXII

JULY TO DECEMBER

1928

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL

EDITED BY THE SECRETARY

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE LONDON S.W.7

EDWARD STANFORD LTD. 12 LONG ACRE W.C.2

AND 29 CHARING CROSS S.W.1

ROYAL GEOGRAPHICAL SOCIETY.

Patron.

HIS MAJESTY THE KING.

Vice-Patron.

H.R.H. THE PRINCE OF WALES, K.G., F.R.S.

Honorary President

F.M. H.R.H. THE DUKE OF CONNAUGHT, K.G., G.C.B., G.C.S.I.

THE COUNCIL.

(*Elected* 18 *June* 1928 *for the Session of* 1928–29.)

President: Colonel Sir Charles Close, K.B.E., C.B., C.M.G., F.R.S., SC.D.

Vice-Presidents.

F.M. the Viscount Allenby, G.C.B., G.C.M.G.
Major-Gen. Sir Percy Cox, G.C.M.G., G.C.I.E., K.C.S.I.
Admiral Sir William Goodenough, K.C.B., M.V.O.
Alfred P. Maudslay, D.SC.
Hugh Robert Mill, D.SC., LL.D.
Lt.-Colonel Sir Francis Younghusband, K.C.S.I., K.C.I.E.

Treasurer—The Lord Biddulph.

Trustees—Douglas W. Freshfield, D.C.L.; The Right Hon. the Earl of Ronaldshay, G.C.S.I., G.C.I.E.

Honorary Secretaries—Brigadier E. M. Jack, C.B., C.M.G., D.S.O.; A. F. R. Wollaston, D.S.C.

Foreign Secretary—The Right Hon. Sir Maurice E. de Bunsen, Bart., G.C.M G., G.C.V.O., C.B

Members of Council.

W. H. Barker, B.SC.
L. C. Bernacchi, O.B.E.
Sir Harcourt Butler, G.C.I.E., K.C.S.I.
Col. H. L. Crosthwait, C.I.E., R.E.
Frank Debenham.
Rear-Admiral H. P. Douglas, C.M.G., R.N.
H. J. Fleure, D.SC.
Sir William Foster, C.I.E.
Major-General Lord Edward Gleichen, K.C.V.O., C.B., C.M.G., D.S.O.
Lt.-Col. C. K. Howard-Bury, D.S.O., M.P.
T. G. Longstaff, M.D.
The Rt. Hon. Sir Halford Mackinder
Col. R. Meinertzhagen, D.S.O.
Lt.-Colonel the Rt. Hon. Sir Matthew Nathan, G.C.M.G.
Lt.-Colonel E. F. Norton, D.S.O., M.C., R.A.
Francis J. R. Rodd.
Rear-Admiral C. W. R. Royds, C.M.G.
W. Lutley Sclater.
Lt.-Col. Sir Arnold Wilson, K.C.I.E., C.S.I., C.M.G., D.S.O.
Col. H. S. L. Winterbotham, C.M.G., D.S.O.
J. M. Wordie, M.A.

Secretary and Editor of Publications—Arthur R. Hinks, C.B E., F.R.S.

Librarian.	*Map Curator.*	*Chief Clerk.*
Edward Heawood	Edward A. Reeves.	C. R. Mobberley.

Bankers—Martin's Bank Ltd. (Cocks, Biddulph Branch), 43, Charing Cross, S.W.1.

General Fay

CONTENTS

NO. 1 *JULY* 1928

FROM THE WHITE NILE TO RUANDA. By MRS. PATRICK NESS 1
IN PORTUGUESE WEST AFRICA: ANGOLA AND THE ISLES OF THE GUINEA GULF. By T. ALEXANDER BARNS . . 18
THE SHORE TOPOGRAPHY OF THE ENGLISH LAKES. By THOMAS HAY 38
THE ANTONINE ITINERARY OF THE AURELIAN ROAD BETWEEN AIX AND ARLES. By R. D. OLDHAM . . . 58
SUBDIVISION OF THE NORTHERN TERRITORY OF AUSTRALIA 61
ANTARCTIC CRITICISM: A REVIEW. By HUGH ROBERT MILL 63
A STUDY OF DESERT PROCESSES: REVIEW. By A. G. O. . 66
REVIEWS: The Celtic Borderland, by F. J. Snell. Marching Spain, by V. S. Pritchett. Spain from the South, by J. B. Trend. Der Abbruch der Insel Sylt durch die Nordsee, by Friedrich Mager. Unknown Italy: Piedmont and the Piedmontese, by E. A. Reynolds-Ball. A Dawdle in Lombardy and Venice, by Inglis Sheldon-Williams. Adventures in Arabia, by W. B. Seabrook. Through the Heart of Afghanistan, by Emil Trinkler. Afghanistan: Eine Landeskundliche Studie, by Emil Trinkler. A Tour in Southern Asia, 1925–1926, by Horace Bleackley. Chinese Ghouls and Goblins, by G. Willoughby Meade. An Outline History of Japan, by Herbert H. Gowan. Op Zoek Naar Dieren en Planten in Britsch Oost-Afrika, by F. E. Blaauw. The Builders of America, by Ellsworth Huntington and L. F. Whitney. A Wayfarer in the West Indies, by Algernon Aspinall. The Prospective Development of Peru as a Sheep-breeding and Wool-growing Country, by Aldred F. Barker. The Arunta, by Sir Baldwin Spencer, K.C.M.G., F.R.S., and the late F. J. Gillen. The Maori Past and Present, by T. E. Donne. Rossel Island, an Ethnological Study, by W. E. Armstrong. Etah and Beyond, by D. B. Macmillan. Problems of Polar Research, by W. L. G. Joerg. The Human Habitat, by Ellsworth Huntington. De Reis om de Wereld door Olivier van Noort, 1598–1601, by J. W. Ijzerman. The Royal Tour of the Duke and Duchess of York, by Taylor Darbyshire. India by Air, by Sir Samuel Hoare. Reminiscences of Adventure and Service, by Major-General A. W. Greely. The Elements of Economic Geology, by J. W. Gregory, F.R.S. An Intermediate Commercial Geography, by Dr. L. D. Stamp. Practical Hints to Scientific Travellers, by H. A. Brouwer. Birds of the Ocean, by W. B. Alexander. A History of Ski-ing, by Arnold Lunn 69
THE MONTHLY RECORD: The Society's Map Curator. Gift to the Society's Map Collection. Snowstorms in Southern England. The "Armand" Pot-hole in the Causses. Archæological Tour in Waziristan. African Railway Development. Explorations in Alaska. The Treeless Pampas. Equatorial Islands of the Central Pacific. Lake-Sediments and Temperature-Distribution. Danish Oceanographical Expedition. The South Swedish Geographical Society 87
OBITUARY: Professor Jiři Daneš. Mr. James White . . . 95
MEETINGS: Session 1927–28 96

MAPS:
Sketch-map of Mrs. Ness' route from the White Nile to Ruanda . . 3
Sketch-map of Portuguese West African Colonies 21
Folding plate to illustrate Mr. Hay's paper on the Shore Topography of the English Lakes . . . . . *facing* 54
The construction of the Antonine Itinerary beyond Aquis Sextiis . . 60
Sketch-map of Northern Australia 62

ADDRESS AT THE ANNIVERSARY GENERAL MEETING. By the PRESIDENT, COLONEL SIR CHARLES CLOSE 97

THE CAMBRIDGE EXPEDITION TO EDGE ISLAND. By H. G. WATKINS 117

THE WADI UM DUD IN THE EASTERN DESERT OF EGYPT. By K. S. SANDFORD 144

THE CENTENARY OF THE BERLIN GEOGRAPHICAL SOCIETY 159

TWO MORE ANCIENT MONUMENTS IN SOUTHERN KURDISTAN. By C. J. EDMONDS 162

PACIFIC POLITICS: REVIEW. By SIR MAURICE DE BUNSEN . 164

REVIEWS: Picturesque Architecture in Paris, Ghent, Antwerp, Rouen, by Thomas Shotter Boys. Industry in Sweden. Guide Illustré de la Pologne, by Dr. Mieczyslaw Orlowicz. Eastern Mediterranean Lands, by Col. P. H. H. Massy. Im Neuen Anatolien, by Richard Hartmann. Soldiering in India, 1764–1787, by W. C. Macpherson. Within the Walls of Nanking, by Alice Tisdale Hobart. Savage Abyssinia, by James E. Baum. Kenya from within, by W. Macgregor Ross. Kenya Days, by M. Aline Buxton. African Jungle Life, by A. Radclyffe Dugmore. A History of South Africa, by Eric A. Walker. Oregon Geographic Names, by Lewes A. McArthur. Jungle Paths and Inca Ruins, by W. M. McGovern. Report of the Svalbard Commissioners concerning the Claims to Land in Svalbard. Adventures in the Big Bush, by C. G. Lane. Internationale Studiengesellschaft zur Erforschung der Arktis. Arktis, von Fridtjof Nansen. Grundzuge der Physische Erdkunde, by A. Supan. Alluvial Prospecting, by C. Raeburn and H. B. Milner. In Quest of the Western Ocean, by Nellis M. Crouse. Christopher Columbus, by Marius André. Interpretations, by E. R. Johnson. An Annotated Map Book of the British Empire, by K. le Cheminant. A Treatise on the One-Humped Camel, by A. S. Leese 166

THE MONTHLY RECORD: Thames Tidal Floods. Hamburg and the Baltic Trade. Iron Ore in South Africa. Development of the Canadian Prairie Provinces. Variability of Rainfall. Old Maps at the British Museum. Geographers and Climatic Data 184

CORRESPONDENCE: Photographs of Big Game, by Lieut.-Col. C. H. Stockley 189

MEETINGS: Session 1927–1928 190

MAPS:

Sketch-map of Edge Island 119
Sketch-map of the west coast of Edge Island 123
Sketch-map of the Ma'aza Limestone Plateau 135
Sketch-map of the Wadi Um Dud, showing Mr. Sandford's route . 147

THE WORK OF THE R.R.S. " DISCOVERY " IN THE DEPENDENCIES OF THE FALKLAND ISLANDS. By A. C. HARDY . 209
THE GILBERT MAP OF *c.* 1582–3 235
LESSONS OF THE GILBERT MAP. By R. P. BISHOP . . . 237
LOST OASES OF THE LIBYAN DESERT. By W. J. HARDING KING 244
REMARKS ON " LOST " OASES OF THE LIBYAN DESERT. By JOHN BALL 250
INTERNATIONAL GEOGRAPHICAL CONGRESS, CAMBRIDGE, 1928 259
THE CORAL REEF PROBLEM. By J. STANLEY GARDINER . . 268
CLAUDIUS RICH : SCHOLAR AND PIONEER : REVIEW. By M. K. 275
MUSIL'S ARABIAN JOURNEYS : REVIEW. By D. C. . . 278
REVIEWS : Alpine Valleys of Italy from San Remo to Lake Orta, by E. Broadbent. Among the Alps with Bradford, by Bradford Washburn. Sir Joseph Banks and Iceland, by Halldór Hermannsson. Greece, by W. R. Miller. Persian Pictures, by Gertrude Bell. A Persian Caravan, by A. Cecil Edwards. The Persian Gulf, by Lieut.-Col. Sir Arnold T. Wilson. Travels in Tartary, Thibet, and China (1844–6), by E. R. Huc. A Relation of a Voyage to Guiana by Robert Harcourt, ed. by Sir C. Alexander Harris. The Lowland Indians of Amazonia, by K. G. Grubb. Orokaiva Magic, by F. E. Williams. The Early History of Tasmania, by R. W. Giblin. Plant Ecology, by Mary A. Johnstone. The Clash of Culture and the Contact of Races, by G. Pitt-Rivers. Race and Civilization, by F. Hertz. The Racial Elements of European History, by Hans F. K. Gunther. Die Waldvolker, by G. Horner. Wirthschaftformen und Landschaft, by R. Ahrens. Proceedings of the World Population Conference, 1927, ed. by Mrs. Margaret Sanger. The Commerce between the Roman Empire and India, by E. H. Warmington. Masālik Al Absār, by Gaudefroy-Demombynes. Voyages and Cruises of Commodore Walker, by H. S. Vaughan. Many Cities, by Hilaire Belloc. From Three Yachts, by Conor OBrien 281
THE MONTHLY RECORD : Crop Yields in England. The Finnish–Russian Boundary North of 68°. Diversion of the Moldau. Forestry in Togoland. Cotton Manufacturing in the United States. The Railways of Brazil. The President's Address. The Salts in the Jordan Basin. Prof. Benedetto's edition of Marco Polo. Mr. Rickmers' Pamir Expedition 297
OBITUARY : Otto Nordenskjöld, by J. M. W. 303
CORRESPONDENCE : ' Intermediate Commercial Geography,' by L Dudley Stamp 304
MAPS :
Falkland Islands and Dependencies 216
Tow-net Work in the Southern Ocean 219
Diatoms, etc., round S. Georgia 221
Diatoms, etc., in Drake Strait 225
Tracks of the *Discovery* and *William Scoresby* 226
Section of Ortelius Map, 1564 . . . . . *following* 304
The Gilbert Map, *c.* 1583 . . . . . *following* 304

PRE-GHAL IN WAZIRISTAN. By CAPTAIN W. R. HAY . . . 305
THE SAILING CHARTS OF THE MARSHALL ISLANDERS. By COL. SIR HENRY LYONS 325
WILLIAM BOURNE: A CHAPTER IN TUDOR GEOGRAPHY. By MISS E. G. R. TAYLOR 329
THE MARINER'S ASTROLABE. By DR. R. T. GUNTHER . . . 342
NOTE ON THE HEADWATERS OF THE YARKAND RIVER. By MRS. G. K. GREGSON 345
THE TRIANGULATION OF NORTH AMERICA. By WILLIAM BOWIE 348
THE ARIDITY OF THE TURFAN AREA. By LIEUT.-COL. R. C. F. SCHOMBERG 357
THE OFFICIAL ROMANIZATION OF JAPANESE. By J. H. REYNOLDS 360
THE INTERNATIONAL MAP CONFERENCE, LONDON, 1928 . 363
SCIENTIFIC EXPLORATION IN SVALBARD 366
COMPARATIVE METEOROLOGY—A REVIEW 368

REVIEWS: Wessex from the Air, by O. G. S. Crawford and A. Keiller. The Place-names of . . . Yorkshire, by A. H. Smith. Somerset, by P. Ward. The Invasion of Europe by the Barbarians, by J. B. Bury. Il Piemonte nell' Antichita Classica, by D. Gribaudi. Mineral Resources of the U.S.S.R., 1925–26. Armenia and the Near East, by F. Nansen. The Wilderness of Sinai, by H. J. L. Beadnell. Popular Handbook of Indian Birds, by H. Whistler. The Geology of Malayan Ore-Deposits, by J. B. Scrivenor. My Two African Journeys, by F. Gray. Timbuctoo, by L. Hall. A Game Ranger on Safari by A. B. Percival. Vom Urwald zur Wuste, by L. Waibel. Chinsenga Handbook, by A. S. B. Ranger. The Climax of a World Quest, by G. F. Cotterill. To the Foot of the Rainbow, by C. Kluckhohn. Histoire de la Guadeloupe (1635–1789), by M. Satineau. Los Aborigenes del Occidente de Venezuela, por A. Jahn. Aerial Photography, by C. Winchester and F. L. Wills. Clavijo. Embassy to Tamerlane, 1403–1406, by G. le Strange. The Evolution . . . of Soils, by Dr. E. Ramann. Biological Chemistry . . . of Sea Water, by H. W. Harvey. Cristoforo Colombo, by R. Almagià. The Voiage of Syr John Maundeville, by J. Bramont. A Cruising Voyage round the World, by Captain W. Rogers. Philips' New School Atlas of Universal History, by R. Muir and G. Philip. Borneo, by O. Cook. Old Cape Colony, by Mrs. A. F. Trotter. Berg-wirtschaftliche Arbeitsgemeinschaft, von M. Krahmann . . 370

THE MONTHLY RECORD: An Old Route across the Auvergne Mountains. Some Place-names in Central Europe. Limestone Caverns of Hercegovina. The Mapping of Arabia. Lake Chad. Water Supply in Tanganyika Territory. Lake Nyasa Levels. The Tsetse Fly. Andaman Sea Researches. Hadley's Quadrant. World Air Communications. Corrections to the Wireless Time Signals. Norse Settlements in Greenland. Monument to Joseph Petigax . . 389

OBITUARIES: Captain Roald Amundsen. Mr. Henry Yates Thompson 397

MAPS:
Waziristan and its approaches 306
Capt. Hay's routes north of Pre-Ghal 310
The triangulation of N. America 350, 351, 352, 355

A TOPOGRAPHICAL STUDY OF THE FLOOD-SWEPT COURSE OF THE PORTH LLWYD ABOVE DOLGARROG. By PROFESSOR W. G. FEARNSIDES and W. H. WILCOCKSON . . . 401
THE WORK OF THE JUBALAND BOUNDARY COMMISSION. By LIEUT.-COL. L. N. KING 420
NOTES ON JUBALAND. By CAPTAIN E. H. M. CLIFFORD . . 435
THE SEARCH FOR COLONEL FAWCETT. A. R. H. . . . 443
THE CONFERENCE OF EMPIRE SURVEYORS. By A. GODWIN-AUSTEN 449
THE LUPATA GORGE ON THE LOWER ZAMBEZI. By F. DIXEY 454
THE TANGO (JAPAN) EARTHQUAKE OF 7 MARCH 1927. By CHARLES DAVISON 456
THE COMMISSION ON PLIOCENE AND PLEISTOCENE TERRACES AT CAMBRIDGE. By K. S. SANDFORD . . 461
THE PANJAB: A REVIEW. By SIR LOUIS DANE . . . 463
THE POPULATION CAPACITY OF AUSTRALIA: REVIEW . 468
REVIEWS: Italy's Ægean Possessions, by C. D. Booth and I. B. Booth. The Empire of the Great Mogul, by J. S. Hoyland and S. N. Banerjee. The Station. Athos, by R. Byron. Farms and Fanes of Ancient Norway, by M. Olsen. The Geographical Basis of European History, by J. K. Wright. Dacia: An Outline of The Early Civilizations of the Carpatho–Danubian countries, by V. Pârvan. Those Ancient Lands, by L. Golding. Palestine Old and New, by A. M. Hyamson. Auf Hellas Spuren in Ost-Turkistan, by Dr. A. von Le Coq. Von Land und Leuten in Ost-Turkistan, by Dr. A. von Le Coq. De Oost-Indische Compagnie als Zeemogendheid in Azie (1602–1650), by N. Macleod. The Indian Year Book, 1928, by Sir S. Reed and S. T. Sheppard. China and England, by W. E. Soothill. The Modern Malay, by L. Richmond Wheeler. The Lake Plateau Basin of the Nile, by H. E. Hurst. South Africa's Past in Stone and Paint, by M. C. Burkitt. Through the Congo Basin, by D. Frazer. Through the Length of Africa, by C. V. A. Peel. The Archæology of the Central Eskimo, by T. Mathiassen. Economic History of the United States, by R. M. McElroy. The Australian Bush, by M. E. Fullerton. The New Zealanders, by H. Bolitho. Greenland, by M. Vahl, G. C. Amdrup, L. Bobé, and A. S. Jensen. Skrifter om Svalbard og Nordishavet. Der Bewegungs-mechanismus der Erde, by Dr. R. Staub. The Thirsty Earth, by E. H. Carrier. Christophe Colomb vu par un Marin, by J. B. Charcot. Testo e Atlante di Geografia Ecclesiastica e Missionaria, by L. Gramatica. Standing Room Only? by E. A. Ross 470
THE MONTHLY RECORD: Survey in French West Africa. Roads in French West Africa. Disaster to Canadian Explorers. Exploration of Western Canada. The Wilkins and Byrd Antarctic Expeditions. A New Type of Polar Chart. Deep-sea Soundings in the Pacific. Study of Ancient Geography. Cook Exhibition at the Record Office. The Navigator Alvise da Mosto. Travel in Turkey. Mosquito Control 489
MAPS:
The Jubaland Boundary 422, 425
Sketch-map to illustrate Commander Dyott's Reports 446
The disturbed area of the Tango earthquakes 457
The Population Capacity of Australia after Geisler 469
Part of North Wales to illustrate the paper by W. G. Fearnsides and W. H. Wilcockson . . . . . *following* 496

CARAVAN ROUTES OF INNER ASIA: THE THIRD "ASIA LECTURE." By OWEN LATTIMORE 497
FROM THE TIEN SHAN TO THE ALTAI. By LIEUT.-COL. R. C. F. SCHOMBERG 532
BOUVET ISLAND 537
MORE LOST OASES OF THE LIBYAN DESERT. By DOUGLAS NEWBOLD 547
CHARLES MONTAGU DOUGHTY: REVIEW 555
MINOAN CRETE: A REVIEW. By E. A. P. 559
THE KAMES OF FINLAND AND THE DATE OF THE LAST GLACIATION: REVIEW. By J. W. G. 563

REVIEWS: Map of Roman Britain. England in the Middle Ages, by J. D. Griffith Davies and F. R. Worts. Sussex, by S. E. Winbolt. Our Own Island, by J. P. Warren. Cheshire, by R. Welldon Finn. The Cairngorms, by Henry Alexander. Round about Andorra, by Bernard Newman. Turkestan down to the Mongol Invasion, by W. Barthold. The Cult of the Peacock Angel, by R. H. W. Empson. The Development of Indian Agriculture, by Albert Howard, C.I.E., and Gabrielle L. C. Howard. Siam and Cambodia in Pen and Pastel, by Rachel Wheatcroft. La Croisière Noire, by Georges-Marie Haardt and Louis Audouin-Dubreuil. Wayfaring in Africa, by Daisy M. Chown. Deserts Idle, by Michael H. Mason. Place-Names of Alberta. The Voyage of Captain Thomas James for the Discovery of the North-West Passage, 1631, by Commander R. B. Bodilly, R.N. The Earth's Crust, its Surface Forms, and Isostatic Adjustment, by Fridtjof Nansen. England's Weltherrschaft, by Alfred Hettner. Land Tenure and Agricultural Production in the Tropics, by H. Martin Leake, SC.D. Three Journeys, by Viscountess Cave. Mountaineering Ventures, by Claude E. Benson. The Life of Lord Curzon, by the Earl of Ronaldshay 565

THE MONTHLY RECORD: New Aqueduct for Rome. The Recent Activity of Krakatao. A Journey to Tibesti. Journeys in Nigeria and the Sahara. Fishing Industry of Sierra Leone. Inland Navigation in Lower Egypt. Soil Wastage in the United States. Subdivision of the Northern Territory of Australia. The Greenland Ice-Sheet. Plutonic Waters. Blaeu's Measurement of an Arc of Meridian. Christopher Saxton. German Colonial Periodical. Gilchrist Studentship. Bibliographie Géographique 1927 . . 579

CORRESPONDENCE: The First Ascent of Pre-Ghal . . . 587

MEETINGS: Session 1928–1929 587

MAPS:
The principal caravan routes of Inner Asia 499
Caravan routes of China to Central Asia, showing Mr. Lattimore's route from Kweihwa to Kuchengtze 503
Positions assigned to Bouvet Id. and Thompson Id. 544
The South Libyan Desert from Egyptian and Sudan surveys and from native information 548
Copies of Sketches in the Log of the "Sprightly," Captain Norris *following* 588

JUL 2 5 1928

THE GEOGRAPHICAL JOURNAL

PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.

Vol LXXII No 1 July 1928

From the White Nile to Ruanda . . . . . Mrs. Patrick Ness 1
In Portuguese West Africa: Angola and the Isles of the Guinea Gulf
T. Alexander Barns 18
The Shore Topography of the English Lakes . . . . Thomas Hay 38
The Antonine Itinerary of the Aurelian Road between Aix and Arles
R. D. Oldham 58
Subdivision of the Northern Territory of Australia 61
Antarctic Criticism: A Review . . . . . Hugh Robert Mill 63
A Study of Desert Processes: Review . . . . . A. G. O. 66
Reviews The Monthly Record Obituary Meetings
Society Notices 1
Contents v

THE ROYAL GEOGRAPHICAL SOCIETY
KENSINGTON GORE LONDON S.W.7
EDWARD STANFORD LTD. 12 LONG ACRE W.C.2
AND 29 CHARING CROSS S.W.1
PRICE TWO SHILLINGS

JUST PUBLISHED

Sotheran's Price Current of Literature, No. 809, being a

CATALOGUE OF

SECONDHAND BOOKS in **GENERAL LITERATURE**,

including SETS OF STANDARD WORKS in nice old Bindings, EARLY CHILDREN'S BOOKS, BOTANICAL WORKS, including the Original Drawings to Millais's Rhododendrons, VIEWS OF AMERICAN TOWNS AND SHIPPING, by CURRIER and IVES, and

A Classified List of the most Important New Books.

Post free from—HENRY SOTHERAN & CO., 43, PICCADILLY, W.1 and 140, STRAND, W.C.2, LONDON

Photographic Enlargements and Prints

by the

Permanent Autotype Carbon Process

Carbons have the first of all essential requirements for reproductions of scientific subjects and record work of every description, viz. ABSOLUTE PERMANENCY. They have too the charm of colour, with rich deep luminous shadows and delicate half-tones,—a combination of qualities which has made Carbon the chosen process from among all others for the Photographic work in connection with most of the great expeditions of the past half a century.

Carbon, the process of 32 beautiful permanent colours.

Write for Price List or call and inspect the interesting examples of Carbon work on exhibition at our Showrooms.

Specialists also in Bromide Enlarging and Printing, Lantern Slides, etc.

The Autotype Company, Ltd.

59, New Oxford St., London, W.C.1.

32 Prize Medals and Awards for excellence of productions.

BOVRIL for Sandwiches

The G

Contents of the Geographical Journal for July 1928

FROM THE WHITE NILE TO RUANDA. By Mrs. PATRICK NESS, *with a Sketch-map and* 6 *Plates* 1

IN PORTUGUESE WEST AFRICA: ANGOLA AND THE ISLES OF THE GUINEA GULF. By T. ALEXANDER BARNS, *with a Sketch-map and* 4 *Plates* 18

THE SHORE TOPOGRAPHY OF THE ENGLISH LAKES. By THOMAS HAY, *with* 6 *Diagrams, Folding Plate, and* 2 *Plates* 38

THE ANTONINE ITINERARY OF THE AURELIAN ROAD BETWEEN AIX AND ARLES. By R. D. OLDHAM, *with Tailpiece* 58

SUBDIVISION OF THE NORTHERN TERRITORY OF AUSTRALIA. *With a Sketch-map* 61

ANTARCTIC CRITICISM: A REVIEW. By HUGH ROBERT MILL 63

A STUDY OF DESERT PROCESSES: REVIEW. By A. G. O. 66

REVIEWS:

The Celtic Borderland, by F. J. Snell. Marching Spain, by V. S. Pritchett. Spain from the South, by J. B. Trend. Der Abbruch der Insel Sylt durch die Nordsee, by Friedrich Mager. Unknown Italy: Piedmont and the Piedmontese, by E. A. Reynolds-Ball. A Dawdle in Lombardy and Venice, by Inglis Sheldon-Williams. Adventures in Arabia, by W. B. Seabrook Through the Heart of Afghanistan, by Emil Trinkler. Afghanistan: Eine Landeskundliche Studie, by Emil Trinkler. A Tour in Southern Asia, 1925–1926, by Horace Bleackley. Chinese Ghouls and Goblins, by G. Willoughby Meade. An Outline History of Japan, by Herbert H. Gowan. Op Zoek Naar Dieren en Planten in Britsch Oost-Afrika, by F. E. Blaauw. The Builders of America, by Ellsworth Huntington and L. F. Whitney. A Wayfarer in the West Indies, by Algernon Aspinall. The Prospective Development of Peru as a Sheep-breeding and Wool-growing Country, by Aldred F. Barker. The Arunta, by Sir Baldwin Spencer, K.C.M.G., F.R.S., and the late F. J. Gillen. The Maori Past and Present, by T. E. Donne. Rossel Island, an Ethnological Study, by W. E. Armstrong. Etah and Beyond, by D. B. Macmillan. Problems of Polar Research, by W. L. G. Joerg. The Human Habitat, by Ellsworth Huntington. De Reis om de Wereld door Olivier van Noort, 1598–1601, by J. W. Ijzerman. The Royal Tour of the Duke and Duchess of York, by Taylor Darbyshire. India by Air, by Sir Samuel Hoare. Reminiscences of Adventure and Service, by Major-General A. W. Greely. The Elements of Economic Geology, by J. W. Gregory, F.R.S. An Intermediate Commercial Geography, by Dr. L. D. Stamp. Practical Hints to Scientific Travellers, by H. A. Brouwer. Birds of the Ocean, by W. B. Alexander. A History of Ski-ing, by Arnold Lunn 69

(*Continued*)

Contents of the Geographical Journal for July 1928

(*Continued*)

THE MONTHLY RECORD:

The Society's Map Curator. Gift to the Society's Map Collection. Snowstorms in Southern England. The "Armand" Pot-hole in the Causses. Archæological Tour in Waziristan. African Railway Development. Explorations in Alaska. The Treeless Pampas. Equatorial Islands of the Central Pacific. Lake-Sediments and Temperature-Distribution. Danish Oceanographical Expedition. The South Swedish Geographical Society . . . 87

OBITUARY:

Professor Jiři Daneš. Mr. James White . . . 95

MEETINGS: Session 1927–28 96

MAPS:

Sketch-map of Mrs. Ness' route from the White Nile to Ruanda 3

Sketch-map of Portuguese West African Colonies . . 21

Folding plate to illustrate Mr. Hay's paper on the Shore Topography of the English Lakes . . . *facing* 54

The construction of the Antonine Itinerary beyond Aquis Sextiis 60

Sketch-map of Northern Australia 62

PUBLICATIONS OF THE ROYAL GEOGRAPHICAL SOCIETY

HINTS TO TRAVELLERS: SCIENTIFIC AND GENERAL. Tenth edition revised and corrected from the ninth edition: edited for the Council of the Royal Geographical Society by E. A. REEVES, F.R.A.S. 1921. 2 volumes. *Crown 8vo;* (i) xv+470 *pages,* (ii) vii+318 *pages. Maps, diagrams, and illustrations.* 21*s* (*to Fellows* 15*s*)

THE R.G.S. TECHNICAL SERIES

No. 1. SOME INVESTIGATIONS IN THE THEORY OF MAP PROJECTIONS. By A. E. YOUNG. 1920. *Royal 8vo;* viii+76 *pages.* 6*s post free* (*to Fellows* 5*s*)

No. 2. ALPHABETS OF FOREIGN LANGUAGES TRANSCRIBED INTO ENGLISH according to the R.G.S. II. System. By MAJOR-GENERAL LORD EDWARD GLEICHEN, K.C.V.O., C.B., C.M.G., D.S.O., and JOHN H. REYNOLDS, M.A. 1921. *Royal 8vo;* xv+71 *pages.* 7*s* 6*d post free* (*to Fellows* 6*s*)

No. 3. WIRELESS TIME SIGNALS FOR SURVEYORS IN THE FIELD. By ARTHUR R. HINKS, C.B.E., M.A., F.R.S. Preliminary edition September 1925, with Supplement January 1926. *Royal 8vo;* viii+12 *pages.* 1*s* 6*d* [*Withdrawn from sale for revision.*]

No. 4. NEW GEODETIC TABLES FOR CLARKE'S FIGURE OF 1880, with transformation to Madrid 1924 and other figures. With an Introduction by ARTHUR R. HINKS, C.B.E., F.R.S. 1927 *Royal 8vo;* xix+46 *pages.* 5*s* (*to Fellows* 4*s*)

The
GEOGRAPHICAL JOURNAL

Vol LXXII No 1 — R.G.S. — July 1928

FROM THE WHITE NILE TO RUANDA: *A paper read at the Meeting of the Society, 19 March 1928, by*

MRS. PATRICK NESS

IN the winter of 1926–27 I planned and carried out an African trans-Continental journey by way of Egypt, the Egyptian Sudan, Kenya Colony, Uganda, the Belgian Congo, Ruanda, the two Rhodesias, and South Africa. Much of the way lay along the beaten track. With some I had become familiar on previous expeditions. But some little lay on African uplands that are comparatively little known, and in this paper I propose to deal with that portion only of my journey that lies between lat. 10° N. and lat. 4° S.—that is, between the Upper Nile Province of the Sudan and Lake Tanganyika. While taking as my theme the wanderings along or away from the Nile of three tribes that we shall meet—the Shilluks, the Masai, and the Batusi—the real objective will be the little-travelled lands of Southern Uganda, the Mufumbiro or Virunga Mountains, Lake Kivu and Ruanda.

Let imagination carry us up the Nile till Khartoum has been left far behind, till the banks have changed from rock or sand to where there is dense undergrowth and floating vegetation. There herds of cattle and of wild game come down to drink, and there the bird life is wonderful beyond description. Always the air seems full of birds, from tiny little bee-eaters no larger than butterflies, which settle on the grasses, making them bend and sway, to cranes, storks, herons, cormorants, vultures, divers, green parakeets, and flocks of teal which whistle past in rapid flight. Downstream will come floating islands, those strange breakings-away from the Sudd, all papyrus, elephant grass and Nile cabbages, the fishing boats of birds. Downstream will come, too, black specks, the beady eyes and nostrils of hippopotami. Among the trees monkeys will swing, and crocodiles will lie on the banks like logs of wood. Near inshore will paddle canoes looking like tied-up bundles of wood, which indeed they are, being but the pithy branches of the ambatch, that shrub with a yellow blossom which interchanges on the bank with masses of purple convolvuli.

Such is the river. Let us look at the peoples. Those that will most often be seen by the banks will be Shilluks, Dinkas and Nuers, savage tribes even to-day, with whom few white men have any intimacy. The first I saw were the Shilluks, the only people in the Sudan who have a kingdom, whose

despotic king, until the British came, had power of life and death. He lives at Kodok, the old Fashoda, where we stopped.

In appearance the Shilluks are tall, lithe, long-limbed, well-formed, and have a proud and haughty look. At times they smear their bodies with oil and red earth or ashes, and the men's hairdressing (the women affect shaved heads) forms their chief and most expensive ornament, and may take so many hours to do that they must preserve it by sleeping with the neck on a wooden pillow. After loosening with a stick, it is piled high in the air in the form of a horn, a tam o' shanter, or some such shape, and matted together with a mixture, the ingredients of which are so disgusting that they do not bear repeating. The constant washing in liquid equally revolting bleaches the hair a carrotty-yellow, when it is worn loose and fuzzy.

The Shilluks grow their staple grain food, dhurra, and keep enormous herds of cattle as dormant wealth, for though they love meat they seldom kill. White ants when in the winged stage are considered a delicacy, and when they kill they collect the blood and cook it, for, unlike their neighbours, the Dinkas, they do not tap their oxen and drink the fresh blood. This the Dinka loves, and it provides him with the necessary salt.

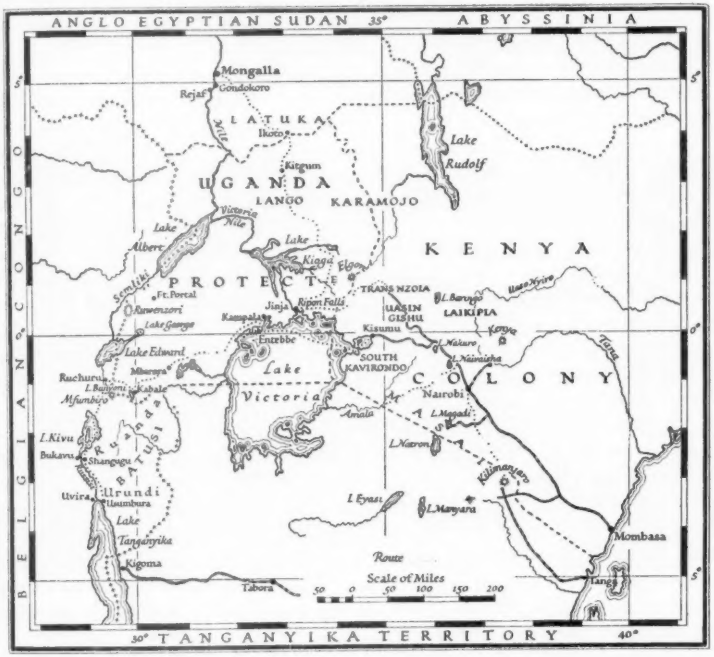
The Dinkas are akin to the Shilluks, with whom of old they were constantly at war. When away from civilization the men go completely naked, and smear themselves, too, with oil and earth, or ashes, though they do not dress their hair as do the Shilluks. They are as tall or taller, and they too are herdsmen.

Farther upstream we stopped early one morning at Adok, which, though it is in the heart of the swamp, has been made to blossom like a garden with lotus, cannas and planted trees by two white men who do not even live there. Yet wildness clung to Adok for all that. Before it was light we were roused by the sound of the beating of drums, that sound which more than any other brings back to one the strangeness of Africa. Nuers, men of a yet wilder tribe, had come to dance to us. As naked as nature made them, covered with wood ash, and with hair the fashionable carrotty-yellow, they danced madly, charged, retreated, feigned battle, looking with their ashened bodies like phantom forms. But their yells were anything but ghostlike, or their chief, who came dressed in black corduroy and gold braid (he alone knew where he got the clothes), but stripped himself and danced as naked as any of his followers. How notorious have these Nuers become! for it was members of this tribe that murdered Captain Fergusson last December on the river's edge at Shambé, no great distance from Adok.

And for five days before we came to Rejaf, the most southerly navigable point on the White Nile, we were in the heart of the Sudd, that great stretch of unending swamp one-third the size of the British Isles, choked with papyrus and 20-feet-high elephant grass, where the precious water is lost by evaporation or soaked up by rank vegetation, and through which the Nile winds a tortuous passage, which becomes at times completely blocked, when boats must needs go up and tear aside the floating mass with Nyam Nyam anchors, so called from their resemblance to the teeth of the Nyam Nyam tribe, cannibals till quite recently and who breed dogs for food—such queer

little dogs with short, stumpy legs! This had happened near Shambé only a short time before our coming.

And while the desolate Sudd closed us in day after day the only human beings that we saw were the naked Aliab Dinkas, who build their thatched huts in the mud on the river's edge among the stalks of papyrus and elephant grass, and live mostly on fish. And there we saw elephants so completely indifferent to us that, though we anchored to the bank and blew our syren to disturb them, they paid no attention except to raise their trunks and wave them from side to side to get our wind. And the natives in their huts almost beside them paid no more attention to them that they to us.



Mrs. Ness' route from the White Nile to Ruanda

On the eleventh day from Khartoum we came to Rejaf, with its pointed hill, where the Sudd had been left behind and the Nile once more flowed freely. Now Rejaf lies on the west bank of the Nile where the road runs down to Aba and other Belgian Congo posts. But to-day on the eastern bank, so opened up has Africa become, there is a broad fair-weather road of excellent surface—the North Equatorial Road, which runs from Mongalla and Rejaf to Kenya Colony and Uganda. Along this road last winter motoring was more or less in the experimental stage. This winter it is so much an everyday affair that it does not merit description. Apart, however, from the beauty and the comparative wildness through which the road passes,

the surrounding country has an interest all its own as being the land which gave me my theme, which, though it came to me of itself after seeing a variety of peoples in Equatorial Africa, had been heard by the earliest of Central African explorers.

When in 1862, to his intense surprise, Captain Speke with Captain Grant —having just discovered the source of the Nile—met Sir Samuel Baker at Gondokoro, which is near Rejaf, he gave him what help and advice he could in his search for the lake he was so soon to discover and call the Albert Nyanza. Among other things he said this : " Inquire well about Ruanda," and " Remember well that the Wahuma are most likely Gallas." Now Wahuma means " the northern people." To-day Bahima are to be found in Uganda, and Batusi (who are recognized as the same stock as the Bahima) live in Ruanda and as far south as Lake Tanganyika.

There has been mutual interpenetration between the various peoples of Africa for countless ages, a constant coming and going, and the land just south of Rejaf, where now live the Latuka people, seems to have been from time to time during these ages a meeting-place and a distributing centre for peoples who were either Negro, Hamitic or Hamitic fused in varying degrees with Negro, all tall, slender, long-limbed, often fine-featured, who one after the other, driven out perhaps by famine or by some invading people, migrated north and south, coming in time to new homes, where they formed a contrast to the peoples of the countries into which they penetrated, and where they became in some cases the aristocrats of their adopted countries or the lords of the land. To-day, if one wanders from the Sudan to Lake Tanganyika, one may meet tribes who, though they are not a homogeneous group, have similarities either in language, features, customs or habits, and may differ widely from the tribes with whom they mingle.

To show the point of intersection, I have taken the liberty of copying a map out of Herr Hofmeyer's recent book, ' Die Shilluk.' There you will see illustrated Herr Westermann's theory that the peoples we have just seen came, at some time or other, from this Latuka country, which is in the Mongalla Province of the Sudan. As to what the Shilluks really are authorities differ, one saying true Nilotic negro, another impure Nilotic negro, and yet another offshoots from Hamitic. Whichever they may have been, according to Westermann's theory, the Shilluks trekked north from the Nile borders around lat. 3° N.

Let us now follow two other tribes, the Masai and the Batusi, both of whom at different times in ages past may well have been settled in this same locality, before they sought and found their present distant homes. On this point I should like to give two quotations from Sir Harry Johnston's book, ' The Uganda Protectorate ' : " The present writer believes that the Masai represent an early mixture between the Nilotic negro and the Hamitic (Galla-Somali). This blend of peoples must have been isolated somewhere in the high mountains or plateaux which lie between the Nile and the Karamojo country. Here the ancestors of the Masai race were no doubt first located, and here the Latuka—descendants of the ancestral Masai—still remain, speaking a language that is closely allied to the Masai tongue. This ancient intermixture between Hamitic and Negro must have been a

Shilluks

Cicatrization on Hutu woman's back

A Mutusi and a Mutwa

Lake Mutanda

Lake Bungonyi

strong power thousands of years ago in the mountainous region east of the White Nile, between latitudes 3° and 5°."

As for the Batusi, they are known to be identically the same stock as the Bahima, of whom Sir Harry Johnston says: "If deductions from native tradition and legend are trustworthy to any extent, the Bahima entered what is now the Uganda Protectorate from the north-east between two and three thousand years ago, remaining for several centuries in the Lango (Acholi) countries east of the Victoria Nile." Hence it seems to me that this particular tract of country assumes an added interest in a journey which brings us among the Shilluks, the Masai, and the Batusi, peoples who to-day remind one often the one of the other.

We will first follow the Masai to Kenya Colony, the way I went a year ago, the way I think they went, passing under Mount Elgon's slopes, while other wanderers sought the great lake; and as we go, we will glance at the lands they passed through.

After leaving Rejaf, as one speeds south, one sees far away to the east the mountains on the Abyssinian border, and to the west the lovely 8000-feet-high Imatong hills, down which, when we camped at Ikotos, I watched a lovely waterfall hanging like a silver cord from the mountain-side. Nearer at hand are hills where rock outcrops, under which lie villages of pointed thatched huts, built where in the old slave-raiding days there were rocks ready to hand to hurl down upon their assailants. Everywhere there are hills and trees, and streams and crazy bridges. No wonder the road is closed in the rainy season! At times the way is bordered with crops of native cotton and grain, among which stand little thatched grain houses, raised on stilts; and the most picturesque bush is one that is covered with its pink blossoms.* The people last year were as primitive as they were hundreds, perhaps thousands, of years ago, but tall and well made. Lango women, like Latuka women, wore strange lip ornaments, darts of stone piercing their lower lips. Their only garments were short frills from the hip, and the men were entirely unclothed. When we stopped among such people it was we, not they, that were the sideshow, for they crowded round with screams of laughter. How soon will this be changed with the coming of the tourist!

From the Latuka country some of the wanderers went down to Lake Kioga, which is choked with papyrus and water-lilies. Beyond it they passed the Ripon Falls, where the Nile, leaving the Victoria Nyanza, starts on its long journey, just a swirl of water between rocks where great fish leap upwards and cormorants stand and swallow little fish. These were the Southern Kavirondo of the Victoria Nyanza (the Ja-Lua), living to-day round Kavirondo Gulf, who are closely allied to the Dinkas and the Lango, and whose speech is akin to the Shilluks. When I saw them many years ago, on my first visit to the lake, the women wore tails as a sign of wedded motherhood, and men and women alike held clothes as much in horror as their Bantu neighbours across the lake held nudity.

* At the Botanical section of the British Museum this was thought, after seeing the coloured slide, to be *Adenium speciosum* Fenzl, of which the Museum has no specimen.

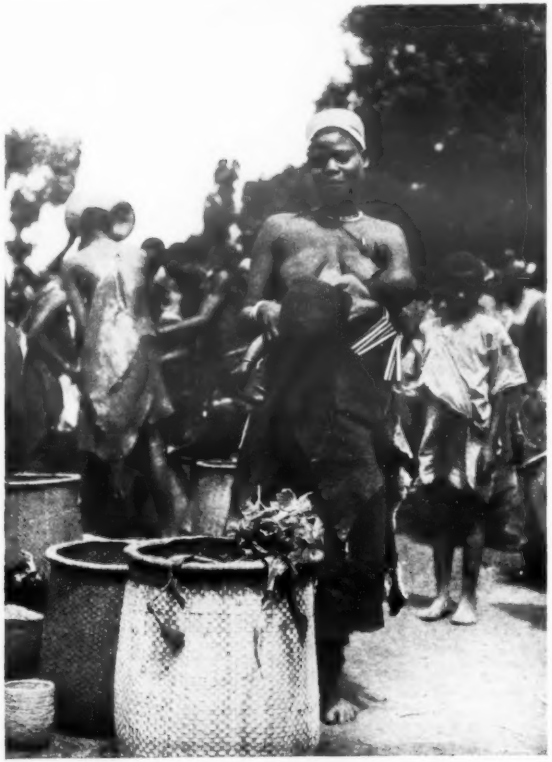
But it was not this way, I think, that the Masai came to Kenya. Surely they left the Victoria Nyanza to one side and headed instead for Elgon's slopes, and mounted up on to the great grass plateaux. And there they found a land of great promise, a land of rolling grass downs for their herds of cattle that were their wealth and their sole care. But all could not have been plain sailing, for it was not an uninhabited land they entered, and till the white man put an end to inter-tribal warfare, the Masai's only youthful profession was that of a moran, or warrior.

The uplands they came to were the Trans Nzoia (7000 feet high) and the Uasin Gishu Plateau. Up and ever higher they trekked as years passed on, and they came to lands at 9000 feet of feathery green bamboos, where in the glades grew everlasting flowers, pink and white and yellow, giant blue forget-me-nots, lupins and bracken, and to the great cedar forests. Perhaps then there was no burnt forest as there is to-day.

Rising still they pastured their herds again on rolling downs, and dropping then till they were at some 8000 feet they crossed the equator. And knowing nothing about equators, they probably did not marvel at the cold ; but when I came this road last year, as I crossed the line I wrapped all my coats about me against the stinging blast. And the Masai pressed on and peopled Laikipai, across which they saw the snow-crowned mountain, Kenya (17,040 feet) with its lovely valleys. Some remained, others trekked south even till they passed Kilimanjaro (19,710 feet)—Africa's highest mountain. There to-day along the border is the Kenya Masai reserve, where they wander with their herds of humped cattle, sheep, goats and donkeys, building their manyattas (villages), deserting them in search of fresh grazing, cultivating no land, despising fowls and fish, living on imported grains when old and very young, and when morans (warriors) on meat and milk and blood. Like the Dinkas, they tap their oxen and drink the fresh blood. Their dead they do not bury, but throw their bodies to the hyænas, unless they are rich or medicine men, when they are buried and their spirits, they say, return as snakes, which they reverence. There, near Kilimanjaro, I saw them last year, but it was not there that I saw them years ago, but, when after following the Kedong Valley, which is a section of the great African Rift Valley, it opened out to the Loiter plains across which we searched for and found the Amala river * in the days when the map was sketchy and a guide unprocurable, where to-day are the homes of white settlers. And on the river farther south I saw Masai that had never seen a white woman, and I shall not easily forget their consternation, for as I dismounted I pulled off my riding-gloves. There were gasps of dismay. " Surely," they said to each other, " this bibi (woman) skins herself." They crowded round, they asked in signs for a repetition of the conjuring trick. I put on my gloves, I took them off repeatedly before an ever-growing crowd of admirers. And when at last my tent was pitched and I sought shelter behind the flaps, they stayed outside only long enough to form a deputation of women that crowded in and begged me to repeat the performance.

The Masai morans, the young warriors up to thirty, oiled themselves with

* The Amala is contributary to the Nile, since from Kenya it flows south and west into the Victoria Nyanza.



A Hutu woman

Tusi headman, Lake Kivu

Entrance to bay on Lake Kivu

The hills of Ruanda

grease and red earth as though they had been Dinkas or Shilluks, and twisted their oiled locks into ringlets ending in pigtails bound with leather. They bore shields of buffalo or ox-hide painted red and white and black in patterns which denoted their clans ; swords, and long-hafted spears, and in peaceful mood topped them with black ostrich feather pompoms.

They spat upon their hands in welcome, a form of greeting I never really took to, and often I faltered when I saw a Masai warrior stride towards me with outstretched welcoming hand, for how well I knew that cold, damp hand-clasp ! * Their war paint was marvellous beyond description, and many a time they came to dance in full regalia—sometimes with lion's head-dress in place of ostrich plumes, and this dress was copied by the tribes among whom they came and with whom they fought.

We traded with " Amerikani," a kind of calico, the coin of exchange being 1½ yards, a length which when knotted on one shoulder and left loose (for the Masai men were indifferent to decent body covering) turned a raw savage into a man about town. But the women, old at thirty, wore all-enveloping robes of skins which rattled as they walked, and, as a sign of marriage, donned brass and iron wire coiled heavily round their necks and arms and legs. No woman must be seen without her heavy iron ear-rings during her husband's lifetime, but at his death she leaves off all ornaments for one year. Both sexes † pierce and distend the lobe of the ear till the resulting circle hangs down to the shoulder and holds great ornaments, if not of wire or chain, of ivory or bone or other gems, and I have seen a man with a jam-pot in his ear for holding snuff.

But we must leave the Masai in his reserve, a changed Masai in many ways, bereft of his long spear, debarred from fighting, but still nomadic, still pastoral, still thinking, as do all pastoral Nilotic peoples, that all work except to do with cattle is beneath his dignity.

To find the Batusi, the last of our wandering tribes, we must cross the Victoria Nyanza and start from Entebbe or Kampala, Uganda's capitals, on my last winter's journey through the volcano lands to Lake Tanganyika. The route runs thus : By motor from Kampala to Kabale on a good road, as all Uganda roads are good ; then with porters only to carry the loads on safari through Southern Uganda to Ruchuru in the Belgian Congo—a track seldom followed except by natives, through the volcanoes of the Mufumbiro range, down Lake Kivu, and by way of Ruanda to Lake Tanganyika, roughly 600 miles.

Having now, unexpectedly, no companion for the journey in front, I was the more anxious to find some " white hunter " who had already been to Kivu whom I could engage to run my safari, though I arranged, alternatively, to take some one who had not been. However, after constant inquiry I heard at the last moment, when at Fort Portal, of a Captain Chapman who knew the route, but who was many days' march away. A runner was sent by the helpful Commissioner telling him that if he cared to come and could reach Mbarara (through which I should have to pass on my way from Kampala to Kabale) on such and such a day, I would take him with me. A

* The Shilluks also spit as a sign of affection.

† Unlike Shilluks and Batusi.

date not far ahead had to be arranged, since I was hoping not only to get ahead of the rains, but to catch the April boat on Lake Tanganyika. While awaiting that day in Kampala I collected my servants and all camp equipment,* including the necessary food, which was packed in chop-boxes weighing approximately 50 lbs. (a porter's load) and one extra heavy load of copper cents with which to pay the porters, who in Uganda would have to be changed daily.

All being ready, I drove the 300 miles to Kabale in a wreck of a motor lorry, passing Sanga of lion fame, picking up Captain Chapman (whom, as yet, I had not seen) at Mbarara and crossing the Ankole Plains, where the long-horned Ankole cattle humped themselves in hundreds and great grass fires smoked. Having passed over Lutobo pass, the second day brought us to Kabale, which is 7,000 feet high, a place of wonderful beauty. In the early morning the deep valley between Kabale and the farther hills was full to the brim with heavy white mist, giving it the appearance of a frozen lake from the depths of which came sounds of activity from the native market. And the foreground was a Commissioner's garden which for luxuriance and brilliance of colour would put many prize gardens in the British Isles to shame. Yet Kabale is the last white man's station in Southern Uganda.

Here the helpful and hospitable A.D.C. had collected for me the fifty porters I required—typical Bakyiga, a poor primitive people, whose clothes are the skins of animals that die, with the hair turned inwards; whose staple food is sweet potatoes; whose beer is made from matama, a yellow grain; whose civilization is of the lowest, and whose religion is witchcraft.

In Uganda I had found the natives polite, indeed, more than politeness had been enforced by their stern chiefs of old. Here in Kigezi country when a native met a white man he would often curtsey deeply, join his hands together as though in supplication, and cry "Osiberege" (a Luganda greeting) with the upward pleading look of a faithful dog.

Out of the fifty porters eight were chosen to carry my machila or carrying chair—four at a time; for I knew I could not walk the whole of the 300 miles ahead, and had prepared it accordingly. Five miles from Kabale, past the native market and over the opposite hill, lay a lovely sheet of water, Lake Bunyonyi, the "Lake of little birds." Sixteen miles in length, the haunt of waterfowl, it is covered in places with lovely blue water-lilies, its edges are thick in reeds, and hills close it in. It has no hippo or crocodiles. Arrived at the lake, the porters were paid each their 20 cents, for canoes awaited us, and in an hour or two we had been paddled across to Bufundi, a beautiful spot on a promontory, our first camp. Here were two clean rest-houses of mud and wood, one side of each open to the air. All seemed clean and fresh, but there was a warning notice against Spirillum † tick, a tick which gives a dreaded fever. Right through to Lake Tanganyika they are a plague, but I was not attacked, perhaps because I followed advice and kept the ground wet, and a light burning at night, for they are nocturnal and love dust and darkness. In the Congo I used tents exclusively, but even

* Except tents, which were bought in Nairobi.

† *Ornithodosos moubata.*

so succumbed to jiggers, those microscopic burrowing fleas that lay their eggs inside you with possible dire results.

At sunset a huge fire was lit, and when darkness fell a guard came, sent by the chief; for this had been ordered, I was told, since some time before a Government official had been murdered. They took off their one skin garment, laid it together with their mats beside the fire, and, naked, lay down in the chilly air and talked throughout the night, in spite of expostulations, so persistently and so disturbingly that I decided in future I would prefer the risk of murder (so remote as to be non-existent) to the certainty of another sleepless night.

From Bufundi we walked through thick forest always rising, across swamps where 12-feet-high giant lobelia grew in bud, and wild red-hot pokers, where were constant tracks of small elephant, till we came to Behungi, where, when the icy storm of hail which greeted us had passed away, I saw before me the crater lands of the mountains called by those who see them from afar "Mufumbiro," which means "the place where there is fire," and by those who live among them "Virunga," a word which may stand only for "mountains" or "volcanoes." It was a view not only lovely, but unique and strange; for the land lying 2000 feet below me looked as though some giant moles had been at work and had heaved up hundreds of giant mole-hills; yet it was the Earth's pent-up force that had piled up the land and left it as wavy as a stormy sea, studded with little craters, grass-grown, but now completely treeless. On the left lay two lakes, Mulera and Chahafi. On the right one more, Mutanda. Between them, but farther off, towered three volcanoes—Muhuvura (13,547 feet), Mgahinga (11,400 feet), and Sabinio (11,960 feet)—the first two rising to cones, the last to rocky peaks. Alas! the view was as illusive as it was impressive, for throughout the volcano country, except directly after storm, there is a tantalizing and obliterating haze.

After a night of cold I climbed down from the bamboo forest, glad of nailed boots, for the storm-swept track was slippery as ice. At the bottom I found a country of decomposed black lava-dust which, when watered, is fertile. Here and there the natives hoed the fields, throwing aside the lava rocks which strewed the ground like cinders from some great furnace. They planted their sweet potatoes, their many-coloured beans, their arum* roots—poor food. Ever winding among the hills, we walked to Lake Chahafi under Muhuvura's summit and to Kisolo, a large native village, where I remained two days as Anderema, the chief, sent out to call in the Batwa, the semi-pigmies who, together with gorillas and chimpanzees, inhabit the slopes of the volcanoes. Primitive and wild, they are apiarists, blacksmiths, makers of pottery, callers of apes, and are the most hideous human beings I have ever seen, so ugly that it seemed but natural that they could (as it is said they can) call to them the monkeys they so closely resemble. And when they had fed sumptuously on beef and beer (the providing of which was my part of the programme) they danced wildly in a cloud of dust, feigned battle, executed masterly step dances, waxing ever more violent, not pausing till the night was far advanced.

* *Collocasia arum.*

Now in the lands from Uganda to Ruanda there are besides the Batwa two other tribes—and now we come to the last of our wandering peoples. As I had come through the bamboo forests in Uganda I had seen men with carrying-baskets on their heads in which Bahima women are borne, who only attain to full beauty when they have become so fat that they cannot walk. Here at Kisolo I saw for the first time their close relations, the Batusi, the aristocrats and the ruling people of Ruanda, owners of great herds, tall (sometimes over 7 feet), fine featured, light in colour, the Hamitic wanderers from the North (of whom we shall see more later); and the Bahutu, the indigenous agricultural Bantu people, black in colour, completely primitive, living in poor huts on sweet potatoes, beans and arum roots, who are the serfs of the Batusi. To the Kisolo market-place the Hutu women came in hundreds to buy and sell their earth's produce, their baskets, mats and roots, and often they wore crowns which, though of banana fibre, looked like polished satinwood. Their garments were tanned skins, their chief ornaments anklets of fibre and wire. On their backs were patterns raised by painful cicatrization, and their heads were shaved in patterns according to their age and standing.

At Kisolo we were near Muhuvura and Mgahinga. One evening I climbed over the opposite hills and looked down on Lake Mutanda. And as I sat on a spur of land and watched the sunset turn the pale colours to a golden haze, I listened to the sound of children's voices rising from the village below ; the francolins called from hill to hill ; the grasshoppers sang shrilly ; all was peaceful. But behind Muhuvura was black as ink and thunder rolled round the mountain's summit. How easily I could understand the ignorant natives' fear of the spirits of the mountains !

At the last camp in Uganda we had left the three volcanoes behind, and were in a land where tree ferns grew, where there were sweeping valleys of great fertility, and where the air was cooler and more salubrious. Across the Congo border we came to lines of untidy thatched huts over which grew climbing gourd vines, and in front of which women trod out grain with their feet. A few hours brought us to Ruchuru, once the headquarters of administration, now half empty with vacant houses among Kapoc trees, eucalyptus and beds of pink roses. But though picturesque and high above the plain, it felt shut in and unhealthy. There we spent two days in two unfurnished houses while porters * were found, with some difficulty, and then we took the road which soon will be, if it is not already, a motor road made of lava rocks knit together with grass, each rock carried on a man's head. Along this track had marched, year in year out, thousands of porters, since everything that came to Ruchuru and the farther Congo had been carried on men's heads. Motors will revolutionize transport.

Down below Ruchuru lay a portion of the Ruindi plains, now almost destitute of game except for elephants, lions and leopards. In Ruchuru all guns and rifles belonging to those going south are sealed in the hopes of preserving what little game there may be. At one village the chief came to

* In the Congo and Ruanda porters were paid 1 franc a day plus food, the exchange standing at 175 francs to the £1 sterling. In Uganda 20 to 40 cents a day, plus food according to the distance. (100 cents is 1s.)

beg for assistance from the white man, for eighteen villagers had been carried off recently, one after the other, by a leopard.

Having left three volcanoes behind, we were approaching others. On our left lay Karisimbe, Mikeno and Visoke ; on our right Namlagira and Ninagonga, the plain dividing the two groups. On the slopes of Mikeno, the only one as yet unclimbed, are to be found the gorillas and chimpanzees of the Congo. Across the valley lay Namlagira, which is no dead volcano but a living thing with a column of smoke rising from its summit and spreading over it like a pall. By night, when the moon is not too bright, the smoke cloud is a glowing red, lit from the fires within.

Turning our backs on Mikeno we camped under flat-topped Ninagonga,* where we said good-bye to the volcanoes, for we were coming to Lake Kivu, which lies beyond them. To-day, except for Namlagira, all the land is still. But only fourteen years ago it was covered afresh with lava-dust and volcanic mud, while the north end of Lake Kivu boiled. How easily, I felt, it might do it again ! From Ninagonga we walked downwards, not yet seeing Kivu for the storms of rain that hid it. But the gorge of Goma, a cleft in horizontal strata, seemed to divide not only the plains from the lake but the storm from the sunshine, for on its farther side Lake Kivu lay dazzlingly clear in hot sunshine, hiding easily the fact that it was one of Africa's stormiest lakes. On the shores grew bushes of heavy-scented jasmine, and chameleons ran twittering in and out of the rocks.

Now, since Lake Kivu is, as it were, only starting on its career, it may need explaining to those who are unfamiliar with Africa. Lying at the end of the Central African Rift Valley it is 62 miles in length, and is surrounded by mountains which rise to 9000 feet, and slope in grassy, treeless, abrupt hills to the water's edge. With a shore-line as intricate as a Norwegian fiord, it is the highest lake in Africa (4829 feet), and has numerous islands, one of which, Idgwi (often called Kwidgwi), is over 22 miles long and rich in soil and in minerals. Its climate is fine, its surrounding soil fertile, and its rainfall abundant, the rains lasting some seven months of the year. It was discovered in 1894 by a German, Count Götzen, and the north end explored in 1908 by a German expedition under the Duke of Mecklenburg ; but it is the Belgians who are about to improve it, and before long it will become one of the well-known parts of Africa.

To-day all its shores are under Belgian administration, but up to 1914 the eastern shores were a part of German East Africa, which after the war was divided up, one part—now called Tanganyika Territory—being given as a mandate under the League of Nations to Great Britain ; the other part —Ruanda, the gem of German East, together with Urundi—being handed in the same way to Belgium. Its western shores are in the Belgian Congo, where the Belgians are beginning somewhat tardily to colonize, growing largely coffee. But Ruanda is not colonized, the land belonging to the Wanyaruanda, the people of Ruanda.

Near Goma, once the Belgian station (now nearly deserted), lies Kisenyi, formerly German, now the Belgian headquarters at the lake's head. It was there that I had to decide in what way I was to reach the lake's end. There

* Active up to 1906.

were three alternatives. Either I could march on with porters or wait for the uncomfortable boat that came twice a month (cabinless, though the time taken was three days, but soon to be replaced). But in native dug-out canoes I realized I should see the lake more intimately. And when I was told that probably only two men had travelled the whole length of the lake in such craft, I determined that if possible it should be my way, and that in so doing I should follow the Ruanda shore. Canoes were, however, hard to obtain, but thanks to Captain Chapman's efforts, together with the special letter of introduction I carried to all Belgian officials, which smoothed my path more than once, Kisenyi's courteous Administrateur persuaded a chief to hire to me four canoes with thirty-two rowers, for which I paid 1 franc a day to each man plus food. My eight paddlers sat on the sides of the canoe, two and two, the luggage being piled on sticks in the middle to keep it out of the wet, for all the canoes leaked, and in the bows there was just sufficient width for my folding chair, my servant squatting behind me. The rowers were not men of Ruanda, but from Bobadana on the Congo shores, and the chief of them was a man of a cannibal tribe with filed pointed teeth. They seemed completely brainless, but if there was one thing they understood it was how to manage a canoe, which was as well, for I had been warned that the water " boiled," as the natives say, in the twinkling of an eye, and that when the Duke of Mecklenburg had crossed the north end two canoe-loads of natives had been drowned. For that reason it was impressed on me that I should keep near the shore—advice that was not always followed.

And now let me give a short but intimate picture of canoeing on Kivu.

Two of Kivu's chief charms are her steeply-sloping grass hills and her ever-changing variety of colour. One day all will be blues and greens, the next all purples and greys—almost such colouring as you would see in Scotland. And not only did it change from day to day but from hour to hour. For in the rains (and they were on in earnest) the storm delays as a rule till after midday, so that in the morning each hill will be clearly reflected, and in the afternoon all view be blotted out. And when storms overtook us we would run for the shore, and there we might find in use a real native banana-stalk umbrella, in shape like half a canoe stuck up on end and supported on the head. And I would wonder at the necessity for keeping bare skin dry, for seldom did we see a Hutu man with a garment larger than a loin cloth.

Often we would land at tumble-down villages, where a gaunt grey-green euphorbia tree might overhang the water, almost the only tree left, for the forest which once clothed the hills was destroyed long since by the natives to provide fresh land for cultivation,* and to-day the Ruanda forest is six hours' march from the shore. For this reason wood is a national problem, and was so hard to find that never from the time we entered the Congo were we able to have a camp fire, however wet or chilly, except for the necessary cooking. When we landed a Tusi headman would come to our tents to arrange for us the porters' food, or a sheep perhaps for slaughter, a cow for milking, or milk in a wooden jar, and the very little wood that could be bought.

* The two forests left are the Bugoie and the Rugege.

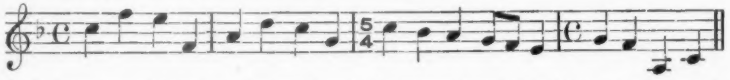
Batwa

Lango women with darts of stone in lower lips

Tusi man and woman

Along the shore the bushes often overhung the water, and I could watch the yellow and brown weaver birds flying in and out of their nests hanging from the branches. Divers dived to escape from us ; yellow-crested cranes stood on the sown patches ; Egyptian geese flew overhead, but I saw no duck, and was told there was little lake feeding for them. There are no hippo or crocodiles. And as I glided on day after day I solved what to me had been a problem. All the smaller islands seemed to float on air. This was, I found, because the vegetation did not start for some distance above the water-line and then hung outwards, and the rock formation being white, it was merged in space.

So intricate was the shore-line that more than once, when I stood on some eminence at the head of a bay, I could look down into two bays at once. And since as a result so much time seemed wasted in following the shore, usually we cut across from one headland to the next, and then for some considerable time we were far from land, and since my paddlers were swifter than the rest, I would lose sight entirely of the other canoes. And then, when farthest from land, my paddlers would ship their oars, pull their little pipes out of the treasure bags which hung round their necks on their bare chests, light them from the flame guarded in the little black pot amidships, and rearrange their positions, making the boat rock perilously and reminding me that I was on one of Africa's deepest lakes. Then, settled once more, they would bang their heart-shaped paddles on the side of the canoe, and away we would go, to the sound of a wild chant, which will for ever ring in my ears, yelled in high nasal voices, running thus : *



Only between the first and second, and the second and third bars, the pointed-toothed cannibal would chant some lines, the meaning of which they would never tell me.

And then the lake might " boil," and down would come the rain, and we would fly for land, the water slapping in over the sides. And sometimes we were only just in time, and when the last boat was drawn up through the long shore rushes, a shout of triumph would come from the throats of the paddlers. And then we would camp, and the sun would set in gorgeous colours ; and the frogs begin to croak ; and the paddlers shelter themselves under some bush, perhaps, if there was no village. And the fireflies lit and dimmed their lights, and the moon rose clear, for though daytime may be stormy on Kivu the lake sleeps quietly. So I shall always remember Kivu, a lake of infinite variety.

Six days of nine to eleven hours each brought us to Shangugu, in Ruanda, which is at the head of the longest, narrowest of inlets at the lake's southern extremity. Opposite lies Bukavu, the headquarters of the administration in that part of the Province Orientale of the Belgian Congo, which was, I found, connected by a *fair-weather* motor road with Uvira on Lake Tanganyika. But having crossed I returned to Shangugu, to start on the last eight

* I have been told that this same boating song has been heard in South Africa on the Kafue and Zambezi rivers.

stages of the safari, marching through Ruanda to Usumbura, on Lake Tanganyika.

In two days the fifty new porters were collected, and leaving Lake Kivu, where the Russisi river runs out on its journey to Lake Tanganyika, I mounted to 6000 feet, to grazing lands of great fertility, where lay plantations of banana (mostly those used for beer-making), sorghum (also grown largely for beer), sweet potatoes, kasava or manioc, beans, peas, millet and arum roots, still treeless, for the Rugege forest was far away. And it was here that I saw more closely the Batusi, who, like the Shilluks, have still a kingdom. Indeed, Msinga, Sultan of Ruanda, is to-day the second most important sovereign in Africa. Every man and woman, every head of cattle, and every acre of ground may be almost said to be his, and until the time of German penetration, when he became Paramount Chief under a Resident, he had complete power of life and death. Like the Shilluks, the Batusi are an aristocracy among a subordinate people, for the agricultural Bantu Bahutu are, as I have said, their serfs. As with the Masai, all work except to do with cattle is beneath their dignity, and their long-horned cattle are to be numbered up to two and a half million. Though at times some, who presumably are mixed with Bantu, have almost negroid faces, they are for the most part graceful, slender, well-featured and, resting habitually as they do on one leg, the poise and bearing of a Mutusi so vividly recalled to me a Masai that I prepared a slide showing the two.

While in this part of the country I was fortunate enough not only to see but to photograph what few white people have ever seen—a Tusi woman. In the Duke of Mecklenburg's book * he calls attention to the fact that never once during his expedition did one member of it see a Tusi woman, and since they are still strictly secluded the photograph is extremely rare. But as far as I could see her features were not so striking as to warrant such careful guarding. It was her legs and not her face that riveted my attention. The Hutu women I had seen had worn narrow anklets, but here were thin circles of fibre, so numerous as to form what could only be described as trouser legs, and so wide in circumference as to render walking, one would imagine, irksome in the extreme. How she moved without shedding bangles at every step still remains to me a mystery. On questioning her husband I found that her life's work was mat making, and her hut spoke eloquently of her industry and skill. Without exception it was the finest Central African hut I had ever seen. Its Tusi form was somewhat peculiar, for, instead of the grass walls being built in a circle, it was as though numerous tall grass bows with inward-jutting points had been joined together in a wide curve until the finishing partition bent towards the centre so as to form a passage from the entrance. Each bow, as well as floor and ceiling, was lined with the finest white matting patterned in black. And, strange to relate, the atmosphere inside was as fresh as the outer air. The doorstep, which was raised and fashioned also in a half-circle, was of a soft pink cement. A Tusi homestead consists of more than one hut inside three enclosures of fences so high that in the innermost courtyard there is complete privacy. Each court communicates with the next, and each has a hut entrance.

* ' In the Heart of Africa.' The Duke Adolphus Frederick of Mecklenburg.

Having photographed the woman, there remained still one snapshot to take, for I knew the husband had spent three hours over his hair in anticipation, the result being the most upstanding crescents I had seen in all Ruanda. For such is the Tusi fashion—two high half-crescents of matted hair on an otherwise shaven skull. Just as the poise and bearing of a Mutusi had brought back to me the attitude and general appearance of a Masai, so the hairdressing of the Batusi recalled to me the hairdressing of the Shilluks. In the same way I have prepared a slide showing a Tusi and a Shilluk side by side.

Ruanda is a fine and healthy country. All too soon I left it and dropped down to the lowlands of Urundi, also Belgian Mandated Territory. And the last camping days were one uninterrupted nightmare.

Unluckily we had experienced what amounted almost to a cloudburst (when during the accompanying violent thunderstorm I had been startled to see a flash come between me and the surrounding grasses, drawn, I doubt not, by the ironstone hill on which I stood), and though we kept as much as possible to higher ground (the lower track being under water), dry land had become swamp, swamps were rivers, and rivers were in flood. Through them all were deep water-filled holes left by the feet of elephants, into which the porters constantly stumbled. The track under the layer of mud was overgrown with long-thorned creepers and overhung with tall elephant grass, off which as we brushed our way through, were shaken myriads of mosquitoes which stung day and night. How well I came to understand why the Ruanda porters refuse to carry into the lower lands of Urundi! My men of Urundi were poor, but the porters that passed me were poorer still. Never shall I forget one who carried his 50-lb. load walking on his heels, for he had no feet at all! And twice by the wayside I saw a man lying with strangely coloured face, dying, it was said, of sleeping sickness.

At the swollen rivers it needed the "river men," as I called them, the finest men of the locality, to carry the loads across, and me too in my chair. And at one they hoisted me on to their hands, their arms raised above their heads to their full extent, and then went down into the rushing water till the chair legs were in it and the water splashing over their mouths. Yet not one load was lost or spoiled.

But all nightmares have an end, and in eight marches from Shangugu we found ourselves in Usumbura, the capital of Ruanda-Urundi, capital still in fact though not in name, for recently a new capital was christened by the name of Astrida, somewhat optimistically, since, though the site is chosen, it is not yet built.

In Usumbura I saw women of Urundi in all their wealth of beads, though to-day they are, alas! beginning to adopt the most hideous variations of European dress. Along the road I had noticed often a peculiar ornament worn by men—a wooden nose clamp; but it was not for several days that I discovered its purpose, and then one day I watched the oddest exhibition imaginable of the use of tobacco. A man placed in his hand a soaked tobacco leaf. Firmly he pressed out the juice till it formed a puddle in the palm of his hand. Then placing the liquid below his nostrils he drew in his breath till he had inhaled the last drop, after which he quickly fastened on his nose

clamp (resembling a clothes peg), and retained it till the juice had circulated through his nasal passages.

Usumbura was the end of my safari. There I met the hospitable Belgian Governor of Ruanda and his English wife, and heard much of the country I was leaving. And since it was there that Captain Chapman turned back, I should here like to acknowledge how much I owed to his efficiency and to his knowledge. There still remained nearly half of the trans-continental journey by way of Lake Tanganyika, the Lualaba River and the railway, which runs from the Congo to the Cape, travelling simple but interesting. Yet, when all the journey was completed, what remained with me most clearly were the lands and the peoples from the White Nile to Ruanda.

DISCUSSION

Before the paper the PRESIDENT (Col. Sir CHARLES CLOSE) said: To-night we are privileged to listen to a lecture by Mrs. Ness on a journey which she undertook from Cairo to the Cape. The particular part of her journey which she will describe to us is that part from the White Nile to Uganda and from Uganda to the Mfumbiro Mountains and Lake Kivu to Ruanda, Urundi, and Tanganyika. Mrs. Ness has made at least six journeys in Africa, and I think you will find in the description she gives of the neighbourhood of the Mfumbiro Mountains and Lake Kivu much which we have not heard before.

Mrs. Ness then read the paper printed above, and a discussion followed.

Col.-Commdt. E. M. JACK: The President has asked me to say a few words on the paper on the ground that I was in some of the country that Mrs. Ness has described, which is quite true; but I have a fear I can add nothing to the extraordinarily interesting account that Mrs. Ness has already given you. Her information is much later than mine. I have to remember that owing to the dreadful passage of time it is now sixteen or seventeen years since I last saw any of the country that Mrs. Ness has described.

I was engaged on boundary work on the frontier between Uganda and the Congo in the neighbourhood of Lakes Albert and Edward, and later in charge of an expedition doing similar work in the region of the volcanoes of Mfumbiro. I can bear out everything that Mrs. Ness has told you about the extraordinary interest and beauty of that country, and I must add that I found it a very rough country to travel in. Mrs. Ness showed us a picture of herself in her travelling chair, and I think her wise in adopting that mode of progression. We, owing to greater hardihood or greater weight—I do not know which—travelled by that method of progression known as going on one's flat feet. I remember how our boots were literally cut to pieces by the sharp and jagged rocks that are found in most of the country round about the volcanoes. In spite of that, the country is really extraordinarily beautiful in that neighbourhood. You have these wonderful volcanoes rising from the plain, and you get remarkable atmospheric effects, from the clearest air, when it is possible to see for hundreds of miles, down to what, if you were not in Africa, you would call a good old London fog.

The people of the country were not quite so attractive. Mrs. Ness mentioned the habit that some of the Nilotic tribes have of smearing themselves. I am not referring to the Batusi, but to the people who lived north of the volcanoes and who had the habit of smearing themselves with rancid butter. I can assure you it was very very rancid; in fact, I can remember to this day the loathsome and disgusting smell of those people, especially when they

pushed themselves close to one in the early morning, when perhaps one was not feeling at one's best.

The lakes are wonderfully beautiful, especially Lake Kivu; it is really like a Scottish loch. I had a year or two before been working round Lake Albert and Lake Edward, where there are flat swampy shores, with dull and rather stagnant waters; but Lake Kivu, with its clean-cut shores, wonderful mountains around, sparkling blue and green water, and refreshing and invigorating air, is a most delightful spot.

I congratulate the lecturer on the marvellous photographs she has shown us, and on her most eloquent and interesting paper.

Col. BEHRENS: I am afraid I have not anything useful to add to what Mrs. Ness has so ably described; she passed across a little bit of country that I knew twenty-five years ago, and I am afraid I do not know anything about the Promised Land into which she was allowed to go. I should, however, like to add my thanks to those already expressed for a most brilliant exposition and description of country at which I had the privilege of looking from a distance only.

The PRESIDENT: As no one else wishes to comment on the lecture, I should like to say that this lecture brings back to me the discussions which took place between the War Office, the Colonial Office, and the Foreign Office with regard to the proper frontiers of British territory and Congo territory in Africa. It was owing to Major R. G. T. Bright that those frontiers were settled, because when he returned from a Boundary Commission in Uganda he asked why we did not settle the question of Mfumbiro. I call it Mfúmbiro because I was on a conference at Brussels that lasted for three months and we pronounced it a hundred times a day for three months as Mfúmbiro. We eventually settled the eastern frontiers of the Congo. Mfumbiro was first discovered by Speke. You will remember that when Speke left Burton in 1857 he discovered Victoria Nyanza, but Burton denied that he had found the sources of the Nile. Speke was supported by Sir Roderick Murchison, who was then President of the Royal Geographical Society, and this Society sent him out again. In 1861 Speke wrote in his diary that he saw the volcanic mass of Mfumbiro. He mentions the word "cones." After that date there was a good deal of discussion as to where those mountains were. On many maps they were placed to the east of the 30th meridian, whereas as a fact they were to the west. Some other countries thought it was best to deny that the Mfumbiro Mountains were there at all, and even some English people did the same. There is a minute—I have not seen it—in the archives of the Foreign Office, written by the late Lord Salisbury, in which he said "Mfumbiro is a myth." As a matter of fact, as we know, it is not a myth, and the outcome of Major Bright's suggestion was the agreement made between Belgium, Great Britain, and Germany which resulted in our getting a perfectly proper portion of that very interesting territory which Mrs. Ness has described.

I thought I would give you that little bit of history, which is not universally known. We have that bit of territory with the corner point on Mount Sabinio. Those mountains are amongst the most interesting in Africa, and I think Kivu must be one of the most interesting lakes. Mrs. Ness in her journey showed a great deal of endurance, for I am sure very few would go down Lake Kivu in the rains. I think we were all impressed by the beauty of the slides shown, and still more impressed by the eloquence and clearness of Mrs. Ness's descriptions. I beg on your behalf to thank her very much.

IN PORTUGUESE WEST AFRICA: ANGOLA AND THE ISLES OF THE GUINEA GULF: *A paper read at the Meeting of the Society on 6 February 1928 by*

T. ALEXANDER BARNS

IT is not easy to capture the impressions and atmosphere of a tropical foreign country and to write or speak to others about it in a few words so that they may appreciate its virtues or its failings. Some inspiration from the country itself is necessary. Countries always seem to me to be very like people, sombre or gay as the seasons change or a wave of depression or prosperity flows over them. Landscapes too have faces as persons have, as inconstant and as inscrutable. Sometimes they frown, sometimes they smile, at other times are sinister or angry. Who has not seen a landscape smile—and flowers too—as a patch of sunlight chased a cloud-shadow across it? And who, again, has not seen an angry countryside with a tempest or tornado brewing and a fierce wind whipping the leaves from the trees? Some countries show a smiling mask covering a satyr's face behind: one may see this in some of the equatorial forest zones, or when looking across a flower-bedecked but oozy marsh of the West Coast, the flowers and elegant weeds hiding and harbouring the germs of malaria and sleeping sickness.

The progressive Portuguese colony of Angola and the islands of the Guinea Gulf, which I am describing to-night, have had stormy histories in the past—light and shadow have crept over them; but to-day, in spite of the unfavourable reaction of political changes, the sun shines and immense advances have to be recorded. The mainland colony, which has an area of some 500,000 square miles and 1000 miles of coastline, presents no satyr's face in these days, except perhaps in the lowland portions of her northern districts. Her seas are calm seas; her breezy uplands smile and keep on smiling; the frown of a tornado is scarcely ever seen. Man himself is more free in Angola from the seven plagues of Africa than in most places. Locusts are almost unknown; domesticated beasts graze over the greater part of the country without being harassed by East Coast fever, rinderpest, or fly. True, in the south the desert regions of the Kalahari push a withered finger into the colony, but only to curl backward beneath the buttresses and flowing waters of the Central Angola Plateau. The country as a whole is well populated with intelligent black Bantu peoples, and the climate is similar to Rhodesia, with well-defined dry and wet seasons.

The Central Plateau, which rises from the coast in a series of broad terraces, forms the core of the country, and is in some respects a most remarkable region. It has a mean elevation of about 5000 feet, and from it, flowing to all points of the compass, a group of beautiful rivers—the Cuanza, the Cunene, the Cubango, and their thousand affluents—some going by devious courses into the Atlantic, whilst others find their way to the Indian Ocean by the great waterway of the Zambezi. The Portuguese describe it in their geographical terminology as the " breast " of the country, and over it the cool ozone-laden breezes sweep up from the Southern Atlantic, depositing an unfailing supply of rain over a land generous beyond all others in Africa with perennial rivers and bubbling springs.

The modern history of Angola—the oldest colony in West Africa, for it dates from the year 1486—may be said to commence during the 'forties of the last century, when a more effective occupation of the country began. One of the first explorations of the interior, and of the Upper Congo River itself, was made by a Portuguese named Rodriguez Graca, who brought out valuable information concerning the natural resources of the country and its peoples; and after him came the famous explorer-trader, Silva Porta. Following on this came the definite foundation of the colony and the opening of its ports to foreign trade. Scientific exploration began with the journey of the famous naturalist Welwitsch across Angola in the year 1853, and a year later Livingstone made his remarkable journey through Barotseland and the Kasai country to Loanda and back across Africa, giving very vivid and pleasing pictures of the hinterland in his book 'Missionary Travels.' Progress was slow during the years that followed, marked however by such advances as the abolition of slavery in 1875; the disallowance by the Brussels Act of manufacture of alcohol in the colony; and in 1891 the delimitation of the frontiers.

Angola has a decided personality that is bound to assert itself and which every visitor to her shores will at once recognize. Her neighbours therefore must not be forgotten. They are the Belgian Congo, north and east; Rhodesia and the Union to the south. Her powerful neighbour, the Union of South Africa, which flings the far northern outpost of Ovamboland against her southern boundaries, is the most definite factor. The Union is assuming a national status, her railways reach out northward to Walvis Bay and Damaraland, and to Rhodesia and the Congo. A consul for the Union has been appointed to Angola, and Union wares are finding their way into the country. There are a number of South African Dutch living in the colony as settlers, including many families of the original Voortrekkers of the early 'eighties.

Another neighbour as important, and perhaps even more so, is the Belgian Congo, and it is to the rich copper mines of the Katanga that the colony owes its present period of prosperity and development. When the richness of these great copper mines became apparent it was necessary to look for an outlet to the West Coast, and a cheaper and shorter route to and from them than that through the port of Beira, which has had for so many years a virtual monopoly of the Congo and Rhodesian traffic. As has happened before in Africa, an old slave and caravan route was selected, leading right across the Angola plateau to the port of Lobito Bay. Along this route has now been constructed with the generous help of our ancient ally Portugal, at great cost in time and money, but entirely with British capital and British material, 770 miles of railway track known as the Benguella Railway, the achievement of Mr. Robert Williams. The railway is now actually complete to the Belgian Congo frontier, and is to be opened some time this year, I believe. The extension of this railway, now being carried through to link up with the Congo–Cape line, will not only bring the magnificent harbour of Lobito in direct and unhindered communication with these mines, but will form the quickest and cheapest route from Europe to South Central Africa, Rhodesia, and Zambezia generally, effecting a tremendous saving in time for mails and travel for passengers and cost of freights, insurance, etc. It will, moreover, put Portugal in the enviable position of having her two great colonies in East and West Africa linked up by rail

from the port of Beira to that of Lobito Bay. When this extension is an accomplished fact I can see a very great number of people taking train not only from Rhodesia and the Congo, but from Cape Town to Lobito Bay, and thence by one of the *rapidos* to Lisbon, and so by the Sud Express to Madrid and Paris.

This is in effect what I myself did, only of course at present the two railways, the Benguella and the Cape–Congo, do not meet as yet, so that the 440-mile stretch between them had to be done by motor. I drove alone in my own car, an old Ford, from Elisabethville, the capital of the Katanga, to the present terminus of the Benguella Railway, although I could have availed myself of the regular bi-monthly motor service which runs between these two points during the dry season from May to November.

I now propose to give a short account of this journey commencing at Elisabethville, the centre of the copper-mining district of the Katanga, across to Benguella railhead, and thence down the track to Lobito Bay, together with the various excursions by car north and south of this railway.

These wonderful copper, lead, zinc, and radium mines of the Congo and the Congo–Rhodesian border always remind me of that saying of Emerson's : " If a man has good corn, or wood, or boards, or pigs to sell, or can make better chairs, or knives, or crucibles, or church organs than anybody else, you will find a broad beaten road to his house though it be in the woods." The Katanga is " in the woods " yet, but the paths are getting more numerous and broader daily.

On reaching Elisabethville we find a growing and well-laid-out town of nearly 3000 Europeans. Here are the Lubambashi copper smelters and the Panda leaching and concentrator plants of the Union Minière, where the most modern and up-to-date methods of treating low-grade ores are being practised. Here are huge furnaces and chimneys, vast ateliers, iron standards, gaunt iron pipes and overhead works throwing out impish arms in a " brawl of mechanism " bewildering to the layman ; and all this built up, carved out, overflowing and almost hidden in the most beautiful, extensive and fertile upland forest area in Africa. Among the many mines, each under its separate management, with housing and hospital buildings and equipment, the new Ruashi mine stands out as worth remark. The huge excavation reminded me of some vast Inca temple-dwelling of ancient Peru, or terraced catacombs of some titanic race long since dead. It is in reality an enormous pit 1000 yards long, half of this broad, and perhaps 400 feet deep. Its sloping terraced sides, pierced in places by drives and tunnels, give the effect of rock dwellings or tombs to which I have referred. A steep inclined way at one end carries a double line of light rails extending right along to the far end of the excavation, for working the mine and hauling out the ore. Looking across from one man-made cliff to another, a deep overload of red clay soil is to be seen, then beneath that again and carrying right down in apparently inexhaustible quantities to the bottom, lie millions of tons of rich copper ore looking for all the world like a lot of dun-coloured clay. Only here and there can be seen strata of the well-known green malachite.

The mine had only just been opened up and put in shape for the army of

Caporollo River, Angola

The Kohema Falls, Angola

Lobito Bay

The Ganda-Caconda road, Angola

workers about to begin on it as soon as their housing accommodation was completed. Close by stood the well-built hospital, doctors' and nurses' houses, and outbuildings all spick and span. That the hospital buildings were amongst the first to be finished augurs well for the system and method employed by the Union Minière, and the eventual success of this new mine.

The Angola–Katanga Motor Service that runs cars between Elisabethville and the head of the Benguella Railway is becoming increasingly popular, and the cars are usually loaded to their fullest capacity. The journey actually takes only five days, each night being spent in a commodious rest-house where good food is supplied, comfortable beds, bedding, and other furniture. Motoring in Africa with well-sprung cars and balloon tyres one finds an uncommonly pleasant mode of travel. There is no unseemly haste: one can stop to shoot a buck or a bird if one has a mind to, the air is caressingly warm, and the passing scenery varied and beautiful. In fact, this and other motor journeys in Africa usually take on the air of a picnic.

For the first 200 miles the road follows the Katanga Railway before branching off to the west from the station of Chilongo, so many opportunities are afforded of seeing something of the mine workings along the Great Copper Belt. After Chilongo, and before reaching the post of Musonoi, a descent is made into the beautiful valley of the Upper Lualaba, which is crossed on a pontoon. The neighbourhood of Musonoi shows every indication of becoming another very important mining centre, for the Ruwe gold mine and the Busanga tin have been located, beside immense quantities of copper. Copper outcrops frequently show themselves in the form of grass-grown ridges and low hills standing out above the thick forest; and here one finds the road metalled with green malachite and pink slate stone from the prospecting pits and trenches round about. The country is well watered and altogether pleasing; and as the elevation is considerable one is surprised to see mango trees growing in some of the villages along this route.

The first rest-camp after leaving the Katanga Railway is called Nasondoi, and then comes Satengo, 126 miles farther on and close to the Belgian and Portuguese frontier posts of Luashi. No customs difficulties are to be feared at either place when travelling under the auspices of the A.K.M.S. The road from here closely follows the Belgo–Portuguese boundary, and the country changes abruptly along the watershed between the Congo and Zambezi. The luxuriant upland forest of the Congo side gives place to the bleak hunger-country of the Zambezi and Kasai watersheds: a flat, high, sandy, scrub country, water-logged in the rains, thirst-ridden in the dry season, the only sign of life the *cantonniers*' huts every 20 kilometres and an occasional herd of antelope, but withal not without its fascination when seen from the upholstered seat of a comfortable car.

After leaving Luashi the last section of the motor journey is soon accomplished by a run of 170 miles into the new township of Luacano, which now marks the farthest point (1241 kilometres from Lobito Bay) reached by the Benguella Railway. This section, from the Congo border to the Cuanza River, is to be opened up for public traffic this year.

It is, in a way, unfortunate that this section of the line runs through such

an uninteresting piece of upland country when on either hand to north and south the country is fertile and rich. The Angola Diamond mines in the Lunda District to the north are in a flourishing state, the most up-to-date machinery having been installed and the sifting and sorting under lock and key, so to speak, from start to finish. Two hundred whites and six thousand black diggers are at work on these mines. It is common knowledge that diamonds have been located in many other parts of Angola. There is the possibility of a branch line being run up to these mines, and one day in the future the building of a southward branch line is also contemplated through to Rhodesia.

Portuguese West African Colonies

When the Cuanza Valley is in sight and the track runs out to the Central Angola Plateau, the scenery improves and the outlook widens. One of the sights of this section is the Kohema Falls, tumbling over a cliff of black basalt 100 metres wide into a chasm 144 feet deep; their resemblance in miniature to the Victoria Falls is very marked.

Realizing that a mere journey by rail across this region of the Cuanza Valley would give me no real insight into the conditions of the country, I went over the route by motor, taking a zig-zag course on either side of the line, passing through the thriving townships of Silva Porto, Chinguar, Bella Vista and Vila

Nova, and visiting many farms and missions. Two of the Canadian-American Missions that I visited had been established for over forty years; they were Dondi and Camandongo, the former being noteworthy for the number and size of its well-equipped industrial schools for both men and women. The Plymouth Brethren as well have very important missionary centres throughout the country and are doing a very great deal of good work amongst the Wambundu and Waluena peoples of these regions.

Off the track of the railway, which runs along the top of the watershed, I found the soil and the vegetation improve immensely; red and pink soils are more in evidence, which grow a very large variety of crops. I have seen few countries better watered by perennial springs and rivers or easier to irrigate and, to go further, better suited to such valuable crops as sisal, tobacco, and citrus. Wherever I ran across a plantation of any of these crops, or spoke to a planter or missionary about them, the answer was always the same: "You can't go wrong on these." Other products I encountered under irrigation and grown on a fairly large scale were coffee and wheat and barley. About coffee on these highlands it is too early to say, but the crop certainly wants a manure or fertilizer. Cereals all do well, planted under irrigation in the dry season; but to get a substantial return liming is necessary. Maize, beans, and European potatoes are grown fairly extensively by the natives, but scarcely at all by whites. The maize is of a very inferior quality, and as such must have, one would think, a very limited market; however, its quality should now improve, as the High Commissioner has recently issued instructions that all maize must in future be graded. This crop together with beans forms the bulk of the trade and export of the country. Although livestock do fairly well on these central highlands, it is not the best land for them, as the annual rainfall is often as much as 50 inches, making the ground water-logged and the pasture sour.

The Cuanza River at Kilometre 726 is crossed by an imposing four-span iron girder bridge of 120 feet to each span, and designed in the same way as the Catumbela Bridge near Lobito, to carry road as well as rail. From Cuanza there is a twelve hours' run across what is known as the *bura-vula*, a treeless moorland region at one time covered with herds of game, to the large town of Huambo. In time Huambo will be a big place, and eventually will supersede Loanda as the capital. It is a maize-trading and distributing centre, and in addition the railway company are erecting here their central locomotive workshops, which, when in working trim, will add a thousand whites to the already large population. An electric power station for these works is to be constructed at Cuando, about 5 miles outside the town. From Huambo a network of extraordinarily fine motor roads radiates all through Central Angola, and from here motor trips can be made to all parts of the country: a great boon to the trader, settler, or visitor. The present capital of the country, Loanda, and the rich and fertile district of Malange to the north, can be reached from here in a couple of days' motor run, and the town of Lubango, the present terminus of the Southern Mossomedes Railway, in less than twelve hours. There is also a very fine road just completed direct to Lobito from Huambo.

During one of my excursions I visited the southern districts of Huila and Humpata. The whole of this southern country fascinates, as do its nomad peoples: the Maquandas, the Vatyilenge and Vandombe, warrior-herdsmen

like the Herreros and Ovambos of South-West Africa. Especially remarkable are their women-folk, with finely cut features and long lashes over dark sombre eyes, many with quite beautiful faces and an elusive charm and grace hard to define. Then in the desert district of Mossamedes are the Vakoroka and the Vilyavikua, speaking an aboriginal Bushman dialect representing the most northerly penetration of the pure Bushmen tribes. The coastal ramparts of the Chella Mountains in the neighbourhood of the thriving colony of Lubango at the head of the Mossamedes Railway are imposing and beautiful, reminding one almost of parts of Switzerland. The whole country is well stocked with cattle similar to the Damaraland breed. There are finely situated mission stations belonging to the Catholic Order of Saint Esprit, at one of which, Huila, there is an extraordinarily fine cathedral with a beautifully embellished interior, the work of black hands under the white supervision of Père Bonnefaux and others of the fraternity. It has a green marble altar of very considerable artistic merit, the stone being both quarried and polished locally. The Father Superior, Père Bonnefaux himself, has been resident in the district for something like forty-seven years. He is one of those splendid and lovable characters—of whom Doctor Laws of Livingstone is another example—whose influence for good in these remote regions of Africa is a very impressive fact. On going round the many industrial departments of this Mission, I found that not only had these good missionaries built a great cathedral and quarried and polished the marble of its altar, but were also teaching the natives such trades as carpentering, sawing, milling, blacksmithing, bookbinding, printing, tanning, and boot-making, besides training natives to become brickmakers, masons, and good agriculturalists.

Humpata may be described as a semi-alpine, moorland country with an elevation of about 6000 to 7000 feet. It is beautifully watered and closely settled. Dotted here and there across the open landscape are small and picturesque homesteads with red-tiled roofs and patches of wheat and forage plants and orange orchards nestling about them. The Portuguese Government have started an up-to-date stud farm on this high plateau, and there are moreover several hangars and workshops for aeroplanes, one of a number of such aerodromes to be found in different parts of Angola.

There are fine motor roads through all this district reaching to the borders of South-West Africa; but incongruously all this stands beside large unexplored areas, civilization not having spread to any extent beyond the roadways and town centres. In the Mossamedes and Huila Districts big game are to be found in considerable numbers and of many varieties. Large herds of elephant roam over the Mopani veldt in the unexplored land between the Cunene and Cubango rivers, and there are some rhinoceros; but both these animals are royal game and not to be shot at the present time. Hippopotamus are still fairly numerous in many of the rivers, and the Greater Koodoo are very common all along the wooded hills of the escarpment. And of course this Portuguese colony is far-famed as the only region in Africa where one may find the Giant Sable (discovered by Mr. F. Varian, the chief construction engineer of the Benguella Railway), the antelope with the longest horn of any game animal. I am glad to be able to record that, owing apparently to

protection by game laws, this fine beast has extended its range and has now been observed in areas considerably removed from its former curiously restricted habitat of the Loango–Cuanda watershed. The smaller Sable Antelope is also to be met with to the east. In this land of giant and dwarf flora and fauna, one hears rumours of a dwarf variety of Eland ; herds of what appear to be very small elands have been seen, but so far none have been shot by sportsmen. The Central Railway where it approaches the port of Benguella may be said to be the farthest northern limit of the Springbok—a slightly larger variety than the ordinary Springbok of the south. Gemsbok are met with in considerable numbers roaming over the Mossamedes desert belt, and two zebras are to be found there, one being Hartman's zebra, a very finely marked and sturdy animal with a pronounced dewlap and heavily arched neck. The Cape buffalo are fairly numerous along the lowland rivers such as the Caporolo, and in the north, near Loanda, the red dwarf variety or bush-cow hold their own in the swamps and thick vegetation of the more tropical part of the colony. Gnu, hartebeest, tsessaby, roan and the black-faced impala are other animals that may fall to the hunter's rifle ; and lions, leopards, and cheetahs frequently figure in exciting episodes during a night's motor run. Owing to the fine motor roads in the country, travelling for the sportsman is cheap, easy, and expeditious, and licences are not costly, though there is rather a heavy duty on rifles.

After my visit to the south, I and my travelling companion—at that time Mr. Frank Varian, whom I have already mentioned, and one of the few Englishmen long resident in Angola—returned to Huambo and, finally, to Lobito Bay. This last of my Angola excursions was made along the railway in one of the Company's inspection cars, very kindly put at my disposal by Mr. Cabral, the African Acting-Manager of the Company.

After Huambo the first township of any size is Caala, where I found a fine station in course of construction. The place also boasts a German dentist, an hotel, a garage, residential houses, and a number of large warehouses for grain and other produce. Just beyond Caala the highest point on the railway is reached (5915 feet) ; thereafter the descent of the first escarpment begins and the track winds itself in and out down the steep sides of the Chitanda Valley flanked by the great buttresses of the mountain known as Elepi. Onwards from here as we follow the valley bottom and debouch from the restricting ramparts of the plateau, we pass through comparatively flat country, leaving behind us what appear to be immense table-topped bluffs and buttresses, some appearing as isolated blocks of the plateau and parted from it by denudation. The high square-top mountain mass of Ganda is one of these—a remnant of the great plateau we have just left. The native inhabitants of these parts are also known as the Ganda, with their stronghold in the great mountain, a sturdy, brown-skinned, well-built, and at one time truculent and warrior people who, in former days, held this route to and from the interior with no uncertain grip.

The Ganda District is in the hands of a very capable administrator whose beautifully kept roads, fine bridges, and neatly painted kilometre posts are the admiration of all who motor in his district. The policy of the Angola Government of presenting a bonus in the shape of a motor car to the admini-

strator of a district who has completed and maintained 100 kilometres of good road has proved a great success; and I am quite sure that if we followed suit in our own colonies, where our roads are often in a shocking state, it would be much to our advantage. The same system has been pursued by the Belgian Congo Government in giving Ford cars to native chiefs who are responsible for the upkeep of their roads, and thereafter wanting to use them themselves, they naturally keep them in good repair. This is the secret of successful road-making in Africa.

In the fertile terraced lowlands round Ganda and beyond in the Cubal Valley, some mixed farming and planting enterprises have been established; and, as the country is well watered and fertile, it seems most promising for sisal and banana growing. As one approaches the still lower zones towards the sea at an elevation of about 1000 feet the country suddenly changes and the sun is obscured by the misty pall of cloud that usually hangs over these ramparts of the south-west coast. Here are forests of baobab trees and phalanxes of gigantic clubbed aloes spreading over a rocky country that must make a wonderful appeal to those visiting tropical Africa for the first time. Above this curious vegetation great megaliths of rock rear their heads, grey and colossal, singly and in groups, of all shapes and sizes: some resembling fools' caps; some likened to sprawling animals; others, again, resembling human forms—an immensely interesting and arresting region over which roam many of the larger game animals. Finally one passes by the Caratavo Summit and the viaducts of the Lengue Gorge, thence through this picturesque defile out on to the flats of the sea-coast.

The old worn-out port of Benguella has not much to be said for it in these days, and its unenviable reputation of the past is hard to live down beside the virile and beautiful harbour of Lobito. Twenty miles of alternating dull red and dirty yellow sand and grey alluvial mud deposits lie between the two places, through which the two rivers, the Cavaco and the Catumbela, have pushed their way; and across these flats both the railway track and a good motor road have been constructed. It is, in fact, the silt from these last-named rivers that, caught by the Benguella Current in its northward course, has formed and continues to form the long sand-spit that has been the making of Lobito harbour. The rich estuarine flats of the Catumbela River have been turned into a large and successful sugar-cane plantation, the river itself being spanned by a very fine one-span bridge of 240 feet.

All those who visit Lobito Bay must be at once struck by its natural advantages as a harbour, and in the future it is destined to become, by reason of the vast natural resources of the African interior which it opens up and its direct and quick communication with European ports, the entrance to one of the greatest highways in Africa. Large sums of money are being spent on improvements, and fine wharves are in course of construction to accommodate and handle cargoes for several ships simultaneously. Even at the present time, owing to the sudden shelving of the sand-spit, large vessels can lie alongside in perfectly calm water and discharge their cargoes less than 30 feet from the shore, affording facilities for loading and unloading which exist nowhere else in Africa. The health of the white population of Lobito in spite of the mangrove swamps in the vicinity remains at a fairly high

standard ; and the fact that these swamps are highly saline mitigates their ill effects. The limestone cliffs that rise behind are arid and healthy, and in every way suitable as a residential quarter for the large town that is to be.

The Portuguese islands of São Thomé and Principe in the Gulf of Guinea are in close touch with Angola, only two or three days' steam, forming a market for a modicum of her exports such as maize, beans, dried fish, salted meat, and livestock. Some months before my Angola trip I spent a considerable time roaming over these two islands and the larger Spanish island of Fernando Po, as well as on Annobon and the mainland colony of Spanish Guinea. The work that took me there was collecting natural history specimens, especially of *Lepidoptera* for the museum of my friend Mr. James Joicey of The Hill, Witley, Surrey, so this portion of my lecture takes on rather a different aspect to the first half and provides as well some variety in this respect. Angola itself, of course, offers an exceedingly rich field for the collector, but unfortunately I had little time to give to this branch of exploration whilst I was there.

This chain of volcanic islands in the Gulf of Guinea at one time obviously formed a peninsula jutting out from the active volcanic region of the Cameroons. The islands lie on a submerged shelf protruding from the mainland, marked, however, by deep depressions. There are two such between the three most northerly islands, and they were formed most probably along a line of fracture at a similar geological period and through a similar cause to the other Atlantic islands such as Ascension, St. Helena, and the Cape Verdes. Professor Gregory suggests that this line of fracture, which extends into the lowlands of the Lower Niger, was contemporary with that which formed the Great Rift Valley, as the lavas associated with the latter formation are similar to those of the Guinea Islands. However, to-day, in spite of their volcanic origin, no activity is apparent except in the thermal springs of Fernando Po, and these, it is interesting to note, are so heavily charged with carbon dioxide as to asphyxiate and kill numberless birds when merely flying near them.

So in these islands of Guinea we have a broken-up peninsula ; and with this we have a chance of observing at first hand, so to speak, how evolution works, for isolation in some form or another is necessary for forming new species. On the Guinea islands, as in Madagascar and the Galapagos, we see evolution actually at work before our eyes, and, to quote one observer, " can study the effect of the prevention of intercrossing after the separation of the islands, the time of separation, and the difference of the conditions on the different islands and the factors that produce the different races." Amongst the plants of São Thomé, for instance, we find that the begonias alone have evolved at least six new species entirely peculiar to this one island. There are numerous unique species of insects and other forms of animal life non-existent on the next nearest island. On one island, for instance, there are Grey Parrots and none on another ; and the same may be said of the Peach-faced Love-bird. Amongst other birds peculiar to São Thomé one need only mention two members of the pigeon family, the blue-black *Columba thomensis* and the beautiful green *Treron crassirostris*, both differing

from the mainland forms as well as from those on the neighbouring islands, although their counterparts are to be found there.

These were questions that engaged my attention, and although there is no geological evidence to prove that either Principe or São Thomé were ever connected with the mainland, the evidence of the fauna and flora, and my own conclusions formed on the collections of insects that I made, go to prove that they were so connected, although long enough ago in geological time to allow for new species to develop their peculiarities and characteristics.

For my special work, I found the islands of São Thomé and Principe the most interesting ; and to give you some idea of the value of these islands from the point of view of the field naturalist, let me say that on these two islands alone I had the good fortune to collect no fewer than 106 new species of butterflies and moths, some of the larger species of great beauty and as broad as one's hand.

As cocoa and coffee plantations occupy the greater proportion of São Thomé and Principe, my wife and I were usually camped out under the central peaks of these islands where the virgin forest still remains intact. Here we had many exciting episodes both by day and night in our continuous search for new and rare insects. It is only in such woodland camps that one can get into daily communion, as one might say, with the wild life about one, and enter intimately into the life of the animals one is in search of, and know something of their feeding places and habits. If you want to be a good collector you must study the feeding habits of the things you wish to collect, for food in the wilds is the one thing that counts.

There are many excitements for the tropical collector, and for us, on São Thomé and Principe, mostly connected with the discovery of new butterflies, so here it may be worth while to recount the tale of the finding and capture of one or two of these rarities. The *Charaxes odysseus* belongs to a genus which for beauty and variety of colouring and general smartness of appearance is justly prized by museums and collectors all over the world. Sure of wing, playful, at times pugnacious, alert and sensitive to every influence about it to an extent that only the collector knows, the male *odysseus* itself is a wonderfully coloured butterfly, bright brown with black markings, the wings being shot across with a purple lustre to which no art of man could do justice. Some thirty years ago a solitary female, differing totally from the male, was captured in São Thomé, fluttering the entomological dovecots not a little. But, although the new species received recognition from this one female, a male specimen during all the thirty or more years that followed never turned up, and, in fact, up to the time of my reaching the island the species was thought to be extinct. Now it has to be borne in mind that the fermenting sap of some trees forms the favourite food of many insects, and one day, after several days of tiresome observation and frequent drenchings of cold rain, I discovered in the valley behind my camp a half-dead Dragon's Blood tree, of the common species known as *Haronga perniculata*, that has a viscid saffron-coloured sap ; this was decomposing owing to disease, and bubbling out in several places on its higher branches. It was about 20 feet high, this tree, growing on the steep mountain side, and, as I discovered, formed the favourite feeding-place of two other rare and striking species of

Principe Island from the Parrot Peak

A Bube village

A Bube chief with leather hat

A bush Bube, Fernando Po

the group to which *odysseus* belongs. The potent brew of this tree, and the flowering creeper surrounding it attracted all and sundry of the insect world, and as I had added a sheep's head soaked in sweet wine as well as some rotting fruit, the call was irresistible. Having rigged up a ladder and platform, here I or one of my native collectors was in the habit of spending the greater part of the day. Then there came a red-letter day, for as I watched a new insect suddenly arrived out of the blue valley below and fluttering around the tree settled on one of its topmost branches; it was a female *odysseus*, which I eventually netted. As the insect was quite perfect and evidently newly out of the chrysalis, I judged that I had arrived on the island exactly at the right season and that new broods of these valuable butterflies were just beginning to come out. My surmise proved correct, for in the course of the days that followed we not only took more of the females but captured a number of the brightly coloured males as well.

Another of my great captures was yet another hitherto unknown Charaxes butterfly found only on the highest mist-clad peaks of the island. With these I had still greater difficulty, having to rig up two 30-feet scaffoldings on the edge of what amounted to a precipice before being able to get anywhere near enough to net one. This insect has been named by Joicey and Talbot *Charaxes brutus antiquus*. On the island of Principe again I had wonderful luck with specimens new to science. This was partly due to the fact that until the last few years the central forests of the island have been closed to travellers because infested by tsetse flies carrying sleeping sickness.

In the course of my work very naturally I came in contact with the plantation and commercial life of the islands, and I had frequent opportunity of observing the workings of the large cocoa plantations there and the labour conditions; indeed, my hospitable friends on the *roças* gave me every chance of doing so. About this I can say with certainty that the comfort and welfare of the natives are studied to a degree that could scarcely be equalled in any other part of the world. These black labourers are mostly Angola and Mozambique boys, both very pleasing types of Bantu manhood. Then there are the Cabindas, the Cape Verde boys, and the local islanders, quite good but lazy and requiring a lot of handling; nearly all speak a smattering of Portuguese and are mostly contracted for a term of three years, many of them signing on for a second period. The management of the labour supply is in the hands of a Government Labour Bureau under a very severe person who is also a magistrate, known as the Curador, and who has the reputation of coming down very heavily on persons convicted of maltreating a native. On the larger estates, some of which run into 45,000 square hectares, I found well-built, well-designed, clean and airy hospitals run on up-to-date lines, usually with a white doctor and dispenser in charge. Great attention has also been given to comfortable living-quarters for the natives and to the kitchen and cooking arrangements. The result of this, as would be expected, is that the health of the entire black population of the island is of a very high standard. My own personal opinion is that the Angola and Mozambique boys are so well looked after on São Thomé and Principe that they return to their homes better men physically and mentally than when they came.

Cocoa is the principal crop grown on both the Portuguese islands, and is

A bush Bube, Fernando Po

A Bube chief with leather hat

of comparatively recent importation, the first seeds and plants being brought over from Brazil about seventy years ago. The plants thrived exceedingly, inducing a number of energetic planters to open up the virgin forest, with the result that the industry took a great hold of the island to the exclusion of almost every other product. The cocoa is of very fine flavour, and to-day is used principally in blending with other cocoas. The harvest season is variable in different parts of the islands, and according to whether the seasons are good or bad, wet or dry. On the Traz-os-Montes Estate, one of the highest on which cocoa is grown (2000 feet is about the limit for a successful crop) the harvest usually begins in June and lasts up to December and January, but when we were there the crop began to come in in September, so there is no fixed rule to go by. Both on cocoa and coffee trees, buds, flowers, and fruit, in all stages of growth, are commonly seen at one and the same time. The crop is well handled in an expert and thorough manner, very different from the primitive methods employed on Fernando Po. Unfortunately, at the present time the insect pests known as *rubracintra* and *heterodera* have reduced the crops by almost half. One would think that something might be done by fumigation with aeroplanes to counteract this. Other products are palm kernels, copra, and quinine bark.

Some 90 miles separate the two islands of São Thomé and Principe, the former being 30 miles long by 22 broad and just about twice the size of the other island. The crater peaks and giant basalt domes and monoliths of São Thomé are on a somewhat larger scale than on Principe, and more spread out, with some occasional extent of littoral, especially to the north, and, to the north-west, even some low undulating pasture land where quail, guinea-fowl, and land-rail may be found. Its numerous torrential and turbulent rivers are moreover of some size, and, rising in the central massif of the island, have carved it up into great gorges and chasms, many hundreds of feet deep, leaving cliffs, terraces, and knife-like ridges of exceeding steepness and in many cases inaccessible. The Peak of São Thomé rises to an altitude of 6640 feet. It is an easy climb, but well worth doing if only on account of the unique primeval vegetation one passes through and the superb panorama of island scenery that meets the eye at every new turn of the path. There are some very rare plants to be found in the vicinity of the peak, including the red *Lobelia thomensis* and another one named after its discoverer Moller. Heather is to be found growing there as well, and the actual peak itself is surrounded with bushes of young Cinchona trees, but the most beautiful flowers of all are the climbing begonias (*Molleri*) with bright green fleshy leaves edged with crimson. There are laurels, and at least one rhododendron, and the rare Cypress, the *Podocarpus Manii:* a tree that I should think would be well worth trying in Europe.

To describe adequately the island of Principe and its "extravagance of relief," as one author puts it, lays one open to be dubbed verbose or grandiloquent. On approaching it by steamer early one morning, the island loomed up out of the sea, seeming to take shape from the curling mists that shrouded it: a fairy island, a cluster of pinnacles, pyramids, and peaks across which a rainbow played. Clothed with tropical verdure to the very edge of the calm seas that embrace its golden beaches, and to the very tops of its mountain

domes and minarets, it has a bewitching charm that casts a spell on all beholders. Although the main peak of the island does not rise to more than 3200 feet above the sea, yet this and the other rugged crater ruins surrounding it would tax the powers of the best mountaineers. The island lies between Fernando Po, 115 miles to the north, and São Thomé, 90 miles to the south, and is about 120 miles from the mainland. Although, like the other ocean islands of the gulf, its formation is entirely volcanic, it differs somewhat from the others in that its mountains run east and west, not north and south. The range is, moreover, formed of a series of fantastic domed and table-like rock masses and knife-edged craters, which present many problems of interest to the vulcanologist. For an equatorial island Principe has a remarkably cool climate, almost bracing, and one sees red cheeks here as frequently as one sees pale ones elsewhere on the West Coast. There are about eighty whites on the island, and some five to six thousand native plantation workers. In the company of two Portuguese I made the ascent of the main peak of the island, where we slept during one night. The view at sunrise was magnificent, with the other black peaks around us rising out of the mist like a crop of mushrooms swaddled in wool.

Principe has been cleared of the tsetse fly, which at one time threatened to stop completely all planting on the island. Under the direction of Dr. Bruto da Costa, with three assistants, there was a rigorous campaign of jungle clearing, drainage, blood examination, segregation of the infected, and destruction of all possible animal reservoirs of the sleeping-sickness trypanosomes, both domestic and wild. It is said that more than two thousand dogs were killed, as well as a very large number of other domestic animals, especially pigs, which were entirely exterminated. But both the disease and the fly were eventually stamped out. A useful method of attracting and trapping the flies was tried with great success. A mixture of palm oil and pine resin was smeared on dark cloth, and tied on the backs of trained native collectors, who were sent out into the jungle, and at one time captured an average of two thousand flies a week by this method. In three years a total of close on 475,000 *Glossinæ* were taken. Dr. Bruto da Costa earned a great reputation for himself over the work, and, I am told, has since been asked to take over a similar campaign in Fernando Po, where the sleeping sickness has assumed threatening proportions; but the authorities there were disinclined to give the doctor the free hand he asked for to deal with it.

Fernando Po may be described as a rough parallelogram with a high mountain range of volcanic peaks, craters, crater lakes, and small plateaux and terraces running down its centre, branching out east and west at its southern extremity. With the exception of the high plateaux, which have a semi-alpine moorland vegetation, the island is covered with tropical forests; beautiful rivers and waterfalls having carved deep chasms in its mountain slopes. To the north and south the *cordilheras* culminate in the two high volcanic cones of Santa Isabel (9369 feet) and the Misterio Peak, literally, the Mountain with a Secret (8600 feet as given by the explorer Baumann), which form a " waist " in the central zone lying between them.

Owing to its position in a corner of the Gulf of Guinea, and to the influence of the fog and mist formed on the great mountain mass of the Peak, Fernando

Po has a somewhat specialized climate differing considerably from that of the mainland close by. It has moreover, owing to the insanitary conditions so long prevailing in the capital of Santa Isabel, as well as for other reasons, been much maligned in the past. Yet, in fact, the climate is one of the best in this coastal region of West Africa, especially at 2000 feet and on the plateaux to the south.

July to October are the wettest months of the year, but exactly the opposite holds on the mainland and in a somewhat lesser degree on the other Guinea Islands. The other eight months are comparatively dry when little rain falls : about 100 inches is the average annual rainfall. The southern portion of the island, by far the more healthy, less swampy than the north, and rising to the beautiful grass country of Moka with a temperate climate and growing European fruits and vegetables, has been almost entirely neglected. In the north cocoa-growing is the one great industry, a small production of coffee and palm kernels being unimportant.

In many ways the Bube indigenes of Fernando Po are the most interesting representatives of its fauna, which determined me to seek them out in their highland home of Moka. Here, if anywhere, in their last stronghold to the south, I should come in contact with some of the old and best types that remain and be able to study at first hand their old customs that are fast dying out. The Bube inhabiting the northern end of the island are, it is generally acknowledged, a poor type, having to a large extent mixed with and been influenced by imported alien tribes and no longer representative of the pure Bube. A people of whom the following summary is true should be worth some study, I thought. The Niger Expedition, which first visited the island in 1841, reported of them : " It is impossible to speak too highly of the character of these peculiar people. They are generous and hospitable towards strangers in their simple fashion. They are kindly disposed to one another in their everyday life, and are always willing to assist one another both in sickness and in health. They are brave, but show a conciliatory spirit and an unwillingness to shed blood, even that of their enemies. They are not cruel in battle, and their religious ceremonies are not stained with human blood. Murder is unknown among them, and one of their chiefs earned for himself the nickname of ' The Executioner ' because he cut down one of his subjects whom he caught in the act of stealing from a boat belonging to a man-o'-war. This shows, too, how adverse they are to theft." This was eighty-five years ago. How should I find them to-day ?

After a very pleasant rest under the hospitable roof of the Rev. George and Mrs. Bell of the Primitive Methodist Mission at the port of Santa Isabel (the capital of the island and the most beautiful harbour that one can imagine), one day I collected my camp kit and, with a stray Bulu native from the South Cameroons as cook, and armed with letters of introduction from the Spanish Governor to the *delagado* of San Carlos, I set out for Moka, first taking a passage round to San Carlos by a steamer that was going there to ship cocoa for Barcelona. The *cordilheras*, as the southern ranges are termed, show up romantically behind this straggling settlement. Built on the steeply rising mountain slopes, the houses are half hidden in a mass of cocoa trees which grow luxuriantly on the rich soil on this side of the island.

A line of trade stores and sheds have been built along the volcanic black sandy foreshore, but on leaving these one is lost in a maze of plantations.

Thanks to the Governor's letter the great difficulty of carriers had been overcome by the *delegado* of the settlement handing out to me a bunch of prisoners in charge of a black sergeant, so with this band of ill-clad miscreants, two of whom had been unlocked from their chains, early one beautiful morning I left San Carlos for the Bube settlement on the high plateau of Moka. The plantations through which the track passed were divided by extensive sections of uncultivated forest land, the mountain slopes forming wide terraces, an ideal configuration for agriculture. The lower estates were old and neglected, but near the first Government post of Musola, where I put up for the night, the plantations were perhaps the finest I have ever seen, trees loaded with immense cocoa pods making it quite evident that the situation and the soil here were ideal for this crop. Round about Musola I found myself amongst the first villages of the pure bush Bube. Their quaint, neatly kept houses, built in groves of banana and oil palms and surrounded by neat fields of trained yam creepers and taro, peeped out here and there. I frequently passed Bubes of a type new to me who had come down from the plateau above, light coloured, tall, and well made, their faces slashed and lined in a peculiar way; they interested me vastly, and I looked forward keenly to reaching the still wilder elements up in the mountain peaks above. After Musola the track soon gave way to the steep ascent of the *cordilheras*. At first all was beautiful forest as before, but presently this became interspersed with small open glades, probably marking old Bube settlements, where the tall elephant grass had found a footing and held its own against the forest. Higher up bracken similar to the English species and short grass began to show itself. Higher up still the surroundings again changed to a park-like country with beautiful clumps of trees, and on reaching the watershed at 6000 feet, we left even trees behind and found a wonderful grassy moorland country with the giant lobelia bordering the pathway in great profusion.

At length, on the second day and after a long tramp in the rain, and having got far ahead of my carriers, I eventually found myself approaching the big Bube " town " of Moka. It presented a weird picture in the heavy mists of these highlands, the huts belching smoke and steam on the cold air. That it was raining hard and that I was alone, was rather a good thing, for I was arriving unheralded and had an opportunity, until the porters turned up, of being taken in on my merits and finding the Bube *en famille*, which I certainly did. Approaching and arriving at the village, I walked in at the door of one big hut and, as I was shivering, I sat myself down by a bright fire that was being made up preparatory to cooking a very generous potful of purple taro roots. Two rather pleasing old Bube women were attending to this, who, without more ado and as if it were quite a natural thing to welcome a white and wet stranger in their midst, made room for me by the fire, at which I sat, grateful for the warmth.

Now this was just the thing I was looking for, " the Bube at Home," no doubt utterly irresponsible, but a very congenial soul I found him. It soon went round that a strange white man had come to the village, and one by one old and young came in to have a look, until the hut was pretty full up.

Looking round the hut, which was rectangular and about 12 feet either way (some are much bigger than this), I found it had three fireplaces and four beds made of slabs of adzed wood on struts, with, in some cases, a duiker or other skin laid across them. Two beds on either side of one fire were apparently for mother and father, and two others for the children, with a fireplace between each two beds to keep them warm in this cold country; the third fireplace, in the corner, was for cooking, over which stood the big iron pot mounted on three small ant-heaps with which travellers in Africa are familiar. Firewood was drying on a rack over each fireplace. The door was at one end (some of the club-houses and larger huts have three and four entrances), and at the other were three kinds of cupboards, partitioned off with slabs of wood in place of doors. Running right round inside the hut, below the eaves and held up by struts at intervals inside the hut, was a fairly broad rack for odds and ends. There were gourds about and some basket-work and wooden platters, as well as some round deep baskets with narrow lidded tops. The house was constructed of the hard stems of tree fern and some slabs of soft wood along its sides. It was thatched with palm, held down by fern stems laid at an angle across it, the palm leaves being also placed under the eaves above the door and intertwined to form a kind of ventilator, a typical construction with all the houses. There was a small verandah as a porch and soft-wood slabs as a door. The Bubes that I saw were pleasant-looking people, not of a pronounced negro type, and with lips that were not without a certain shapeliness of Hamitic cast. Judging by their fields they are good agriculturalists.

On looking through the village after the rain let up a bit, and on my way to see the chief Bube, I noticed, contrary to what I had heard, that these people could make good clay pots or rather open bowls. These were to be seen everywhere lined up under the eaves to catch the rain-water that fell from the roofs. The beautiful crystal water from the rushing stream close by was running to waste as far as the Bubes were concerned, for they seldom draw water from the stream, but make use of this rain-water, which makes everything cooked with it taste of smoke. I found the houses in the village built closely together, the roofs being high-pitched and in structure resembling those to be seen in parts of New Guinea. They were in irregular formation, some shut off into yards with palisades of the omnipresent tree-fern. These tree-fern stems are used for a lot of things, and close by was a large forest of them, which may even account for the Bubes' predilection for this part of the island, for your Bube finds the stems easy to pick up, and moreover, easier to cut with their machettes than other trees. The villagers appeared to me to be a clean lot of people with little of that peculiar odour of the native African about them, which is no doubt due to the cold climate in which they live. One woman was even washing herself (refuting the stigma of uncleanliness that many travellers have laid upon the Bube) outside the village, in hot soap and water, which she was dashing over her back from a bucket, and steaming in the cold air.

On reaching the chief's hut—which was paved in front with large cobbles of lava, with three doors in front and one behind leading along a passage-way into the women's quarters—I found him out, so sat down by one of the fires

to await his return. Later, when he came in, he turned out to be an interesting and intelligent old man with a grey beard and a withered, puckered, seamed and cut, hardy old face, alert and keen. Wearing no clothes to speak of, he had just the typical light-brown skin of the bush Bubes, and in his face just some look of benevolence that perhaps accounted for the large village and the many people that had collected around him, for Moka is the biggest settlement on the island, the gathering-place of the clans, with a tendency to become the centre of this diminishing race. The chief's wrists and ankles were bound with broad bands of intricately woven shell beads that went for money amongst these aboriginals in the old days. Seeing a heavy and broad anklet of these beads hanging up on the roof I offered some pesetas for it, but he replied, " I will not sell it to you, but I will give it to you," a very generous offer and in keeping with that independent spirit of the race about which I had heard so much !

My stay amongst these pleasant people well repaid me, but I fear the Bubes as a race are surely doomed, by sleeping sickness, in-breeding, and the evils following upon access to strong wines at every store on the island. They are now a mere remnant of a fine race. Before I left their pleasant village-town I climbed up to have a look at their former stronghold, which was on the inner slopes of the crater-lake known to them as Iloa (the maps have it Moka Lake). It is a beautiful place, the extensive lakelet of water lying like a great moonstone set deep in an emerald cup of verdure and throwing out pillars of vapour which climb heavenward, attenuated and ghost-like. Above a break in its southern rim towers the Misterio Peak.

I took my final leave of Fernando Po by climbing to the top of the Santa Isabel Peak with the Rev. George Bell and two Spanish friends. We made a delightful camp just below the summit, where we had a chance to appreciate the splendours of the view from this elevation and to record with our cameras the extraordinary wealth of tropical vegetation that grows so luxuriantly on the slopes of this famous volcano.

The Governor-General of the Spanish possessions in the Gulf of Guinea, General Nunez de Prado, having kindly invited me to accompany him on an official expedition into the interior of the mainland colony of Spanish Guinea, I ended my travels by a sojourn of some weeks in the forests of this region. My prime interest was to obtain specimens of the gorillas that are fairly common in this colony, and I was so far successful in that I brought out one complete museum specimen which was identified by Mr. J. B. Burlace, the Managing Director of Rowland Ward, the famous taxidermists, after a description by Lord Rothschild, as belonging to a new species of this ape whose habitat is apparently confined to the valleys of the Campo and Benito rivers : the second specimen that had ever been obtained up to that time.

DISCUSSION

Before the paper the PRESIDENT (Col. Sir CHARLES CLOSE) said : I suppose those of us who have travelled in Africa are more familiar with the East Coast possessions of Portugal than the West Coast. We know more about Lorenço Marques, Beira, and Chindi than about Ambriz, Lobito Bay, and Loanda, so that it is all the more desirable that we should have a lecture on Portuguese

West Africa, especially as it is a subject with which we have not dealt for some time. It is also desirable that we should all, particularly English geographers, have some knowledge of the way colonies are managed by other countries. I am convinced we have much to learn from them all. Mr. Alexander Barns, the lecturer, is well known to us as a traveller and naturalist : he shot the elephant which is now set up in the great hall of the Natural History Museum at South Kensington. He has a high reputation amongst those who study natural history, and is also a geographer in the true sense of the word.

Mr. Barns then read the paper printed above, and a discussion followed.

His Excellency the PORTUGUESE AMBASSADOR*:* My small knowledge of the English language does not permit me to deliver a long speech on this occasion. I hope, therefore, that you will forgive me for limiting myself merely to addressing a few words to you. Their purpose is, in the first place, to thank the Royal Geographical Society most cordially for its kind invitation to attend this meeting, and for the hospitality which has been extended to me. The reason which I have already mentioned would have rendered it naturally difficult for me completely to understand the address which Mr. Barns has just delivered and in which he referred to Angola and Portuguese Guinea, had he not been so kind as to acquaint me of its substance beforehand. I was certain, nevertheless, that Mr. Barns would temper justice with benevolence in the remarks which were suggested to him by what he saw in those Portuguese Colonies. He will, undoubtedly, have found mistakes and defects in the work which the Portuguese have carried out there ; but, taking into account the means at my country's disposal, he will have appreciated the effort which that work represents, and he will have recognized that the qualities have not become extinct which led the Portuguese people to contribute to the history of human civilization several pages—which you will permit me to recall with pride—and to lay, in a new world, the foundations of a nation which emancipated itself, which prospered and became great, a close friendship having been unalterably maintained between the two countries.

I trust that Mr. Barns enjoyed from my countrymen in Angola and Portuguese Guinea the friendly reception which, in my country, is always accorded to strangers who respect the legitimate national susceptibilities. As an exception, some may have responded to such friendly reception with sentiments which are not positively friendly, nor inspired by a spirit of justice. For this reason my satisfaction in thanking Mr. Barns is all the greater, for the pleasant references to my country which he has included in his address.

Dr. T. F. CHIPP (Assistant Director, Kew) : Mr. Barns has referred more particularly to the settlements and plantations of Angola, but the natural vegetation of that part of Africa is also extremely interesting, and some of the specimens which he has collected, and which I have had the opportunity to see, illustrate one or two most interesting points. The region in which he has travelled forms part of that great " no man's land " encircling the huge equatorial forest of the Congo in which a battle has been waged for many ages between the forest and the grassland. Undoubtedly, the forest formerly extended very considerably farther than it does at the present day, and equally undoubtedly it would be able to retain its earlier limits were it not that man, with his practice of shifting cultivation, and his hunting, fires the grass and kills off the trees and seedlings. We have in this area, therefore, advancing grassland, and tongues and patches of forest which have been left behind. Some of the forest specimens throw in their lot with the grassland and take on very curious forms in order to live under these very harsh conditions. One

of the specimens Mr. Barns has brought back is *Cryptosepalum*, which has a small woody stem, almost underground, in shape like a badly grown beetroot, and from this arise shoots only a few inches long. In this we are inclined to see a plant that has been derived in course of time from the tall *Brachystegia* forest tree. Another specimen very like the *Cryptosepalum* in appearance is an *Ochna*, which has its representatives in tall shrubs and small trees in the forest.

Some of the most interesting problems of this part of Africa are concerned with the root systems of plants. In the case of the common Fan Palm (*Borassus*) the seed falls to the ground, and the hypocotyl grows into the ground 2 or 3 feet, and from that process the young plant arises. When it gets quite established it ventures forth to fight with fire and drought conditions. Other trees also have quite a deep woody root-system. Only the other day I heard of a fig, from the neighbouring country of Rhodesia, growing on the side of a crevasse, with roots which had been actually measured to a depth of 350 feet. At the same time many of the commonest trees have very shallow root-systems. It is most extraordinary, and a problem about which we know little at present, how they manage to survive the fires and the drought.

The islands to which Mr. Barns has referred also have most interesting problems of their own. The sub-alpine vegetation which is found in these African islands, and again right across on the East African equatorial mountains, on the Cameroons peak and in higher altitudes and lower altitudes in the highlands of Nigeria, the Futa Jalon of French Guinea and the southern part of Angola, is associated with conditions that do not obtain to-day, and some remnants of this vegetation are separated by more than 1000 miles of dense equatorial forest. To this vegetation belongs the Lobelia and Heather, to which Mr. Barns did not refer but of which he has specimens, and that peculiar *Begonia baccata* which is only known from San Thomé, of which Mr. Barns brought back seeds which, unfortunately, failed to germinate at Kew. It is to be hoped that travellers such as Mr. Barns, despite their many commitments and interests, will always be able to bring us back further specimens and more pictures and notes on vegetation.

The PRESIDENT : Mr. Barns has given us an admirable lecture, and we have learnt a great deal about Angola and the two islands, San Thomé and what we must now call Principe [mute *e*], though when I was young I was told it was Principé. Angola has shown us how to make roads. There are many British protectorates and colonies where the roads are not in a good state, and our protectorates might copy some of the devices which the Portuguese have adopted in Angola. Every now and then the officials of the Colonial Office take a trip in East or West Africa to see something of the administration of territories for which they themselves are largely responsible, but I do not think they ever go farther afield to visit the Portuguese possessions, or the Congo, or French possessions. It would not be at all bad if our colonial administrators included in their tours such territories so that they might see what is being done in foreign possessions. Mr. Barns has given us an excellent lecture, and I am sure you will agree with me that the hearty thanks of the Society are due to him.

THE SHORE TOPOGRAPHY OF THE ENGLISH LAKES;

a paper read at the Meeting of the Society 12 March 1928 by

THOMAS HAY

Introduction

BEFORE describing any special lake shores there are one or two features which may be touched upon so as to clear the ground for a quicker description afterwards. Dr. Mill, in his article on "The Bathymetrical Survey of the English Lakes" in the *Geographical Journal*, July 1895, says, while speaking of the beaches of these lakes, "The heavier portion of the detritus rolling down the hillside or carried along by flooded streams stops on the flat beach, and it is curious to see long lines of boulders ranged along the water's edge in some lakes as uniformly as if they had been placed by the hand of man." These boulders on the beaches of the lakes are indeed the most striking feature of the whole shore scenery. But the most curious and striking thing about these lines of boulders is that they are found in numberless places where the explanation above cannot give their true *raison d'être*. In many places, such as the east sides of Ullswater and Derwentwater, where the steep slopes of Place Fall and Falcon Crag dominate the waterside, the boulders have undoubtedly rolled down and taken their places where we now see them lining the shore. But the most striking lines of boulders are found on shores where there is no steep fell impending over them, as for example on the shore below the gentle slopes of Glencoin Park between Glencoin and Gowbarrow on the west side of Ullswater. These boulders puzzled me for a long time and I could not conceive how they came to be arranged exactly as Dr. Mill describes them, but in such a position that the rolling-down theory is impossible. It was inconceivable that they could have been dropped just exactly in the present line by the ancient glacier. It was equally impossible that they could have been arranged by the waves of the lake, because some of these boulders are of a huge size. The boulders themselves in places such as the one in question contradict the rolling-down explanation for the following reason: On one particular piece of shore they are of various materials, whereas if they had rolled down they ought to be all of the rock of that special place. Many of them bear marks in their shape and surface of having been subjected to glacial action. The shore in the place referred to is backed by gentle slopes of boulder clay. In fact, the boulders themselves are the heavy remnants of the moraine which except for these the wave action has completely removed. The beach has been cut out of the sloping fellside, the clay has been washed away, the smaller boulders have followed the same fate or have gone to provide shingle; but these huge boulders now lined up so strikingly on the little level bench between the slope above and the slope below water are the irregular rocky skeleton work of a vanished strip of moraine.

The general features of this type of beach are a width above the average, the comparatively gentle slope of the boulder clay fellside, and the row of boulders on the shore generally lying just where the wave action is noticeable in storms. This kind of beach might be referred to as the Glencoin type.

Another very common kind of shore arises where the valley is lined with

boulder clay to a considerable depth. In this case the streams find the boulder clay less resistant than the solid rock, and the surface forces of denudation mould it into rounded outlines. The result is that the streams bite out bays in the lake shores, and the intervening portions remain as rounded protuberances which project into the water exactly like delta fronts. In fact, these protuberances have such an extraordinary likeness to deltas that for a long time I thought they actually were deltas belonging to vanished streams of the glacial epoch. But the true delta profile is lacking, and it is this difference which shows the real nature of these formations. The delta has a straight line as its surface line when viewed from some little distance away on the shore. These boulder clay protuberances have a surface line which is more irregular, and generally rounded and lumpy. At Beauthorn on Ullswater there is a protuberance which has a great likeness to the delta shape. There is an even more remarkable one at Rampsbeck which projects into the lake nearly opposite to Thwaitehill Neb on the east side of Ullswater. Dr. Mill's map of this lake shows a band of shallower water between these two projections, and probably the ridge of boulder clay has been continuous right across the valley. I think it will be found that when the words Neb or Ness occur, we generally have the rounded projection formed of boulder clay moulded by the wave action and the forces of denudation. It is so on Ullswater, Haweswater, and Bassenthwaite, although there is one case on the latter lake which needs further examination. This very common and very distinct kind of shore, where we have a sinuous margin of round projections and curved intervening bays, will be referred to as the Watermillock type. It occurs all along the west shore of Ullswater from Skelly Neb to Rampsbeck, and also on the opposite shore to a less extent.

In connection with both the Glencoin and the Watermillock type of shore, we find another feature which arises from the layer of boulder clay in the valley. This is the presence of whalebacks of boulder clay running up the fellside at right angles to the shore-line. The more or less workable medium of the boulder clay allows the runners to excavate shallow valleys in the surface, leaving the whalebacks as great ridges perpendicular to the margin of the lake.

In some places on the lake shores where the supply of small material is sufficient, and where there is a great number of tiny surface runlets, the land is gaining on the water by a slow growth lakewards. The vegetation in these places is sufficiently strong to combine with the growth of land in forming a definite gain from the water. The wave action seems unable to arrest the gain of the land. One strip of shore where this occurs is on the west side of Ullswater just north of the mouth of Longthwaite Beck. The same feature occurs about the middle of the east side of Coniston and on the east side of Low Water in Haweswater. This " slow percolation " type represents a growth quite different from that effected by delta formation, although each tiny trickle of water when considered individually, acts in the same way as the larger streams.

This raises the whole question of the ultimate filling up of these lakes. That is their natural destiny, as it has already been the destiny of numberless lakes and tarns whose ancient flat areas can be seen all over the district.

But apart from the deltas and the alluvial heads of the lakes, those parts of the shore-line where any noticeable gain by the land on the water is taking place, are comparatively few. The greater part of the shore-line rather shows the other process, erosion by the waves, so that the extinction of the lakes is being brought about not by a general advance of the land into the water, but rather by the raising of the floor.

A very interesting point in the evolution of the shore-lines is the direction of movement of materials along the margin. It will be found that each lake has generally a prevailing wind which determines this movement. For instance, on Ullswater, which lies roughly south-west to north-east, the general movement of material is down the lake, owing to the action of the prevalent south-west winds. The most useful indication of this movement is the condition of walls running down into the lake at right angles to the margin. Such walls are not uncommon, and as a rule they run right into the water to prevent animals straying from one field to the next. In places where there is much drift along shore it will be found that the level of the beach is higher on the windward side of the wall, and also that the beach projects farther into the water on that side. Such walls will be referred to as walls with differential deposits. In a hard-rock area, as in the Borrowdale parts of Ullswater, there is practically no movement of gravel along shore, except just near stream mouths. Consequently beaches form only near stream mouths, or where other suitable material can be found. In some cases this is provided by moraine.

The beaches vary extremely, not only in size but in the nature of the materials of which they are composed. The biggest beaches are found where there is a plentiful supply of stony material brought down by streams, and an adequate wave action to break up the gravel. For example, there is a magnificent beach at the head of Buttermere because two considerable streams bring down rock material, and the predominant north-west wind effectually drives the material back on the south end of the lake.

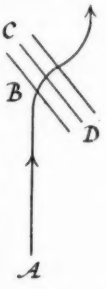
Contrast this with the south end of Ullswater, where two equally big streams enter after junction, but where there is much less wave action, as the predominant wind is the south-west. The best beach on Ullswater occurs north of Glencoin Beck mouth. Here the southerly gales carry the material from the beck along shore, and bank it up in a fine shelving beach. The actual material of the various beaches is of course dependent on the kind of rock from which they have been derived. Just as the appearance of the talus of scree on the fellside below an exposure of rock in the central area will vary in character according as the rock is tuff or andesite or rhyolite, so the shape and colour and size of the pebbles on a beach vary from one lake to another, or even from one part to another part of the same lake. On the great deltas of Church and Yewdale Becks on Coniston, there are great quantities of more or less flat discs of the more fissile stone found in the Upper Silurian rocks—splendid material for the schoolboy's ducks and drakes. On the Borrowdale parts of Ullswater and elsewhere the beaches are formed of fragments much more evenly equal in all three dimensions, though not by any means assuming any particular shape or regularity. On the west shore of Crummock Water a very beautiful beach is found, con-

sisting of a mixture of the blue-grey Skiddaw slate fragments and the pink pebbles of the granophyre.

The movement of heavy material along shore takes place only in shallow water, and it is interesting to see how effectual is any natural groyne such as the curious spit of shingle that juts out at right angles to the shore, and ties on Low Ling Crag to the west shore of Crummock. South of this point there is a bigger percentage of granophyre in the Skiddaw slate than there is to the north of it.

Both shores of Coniston are largely determined in their minor details by the north-east to south-west trend of the Upper Silurian rocks. This affects the course of streams, the little rocky promontories, and the accidents of the beach. The latter often has little jagged ribs of rock running across it in this special direction. The little streams on the west side, south of Hoathwaite Beck, nearly always open to the lake in a north-easterly direction.

When a stream is running across the lines of bedding of a rock, it often shows a tendency to adopt a direction at right angles to these lines rather than an oblique direction. This seems to be exemplified by the upper parts of the streams on the east side of Coniston about the middle of the lake. Thus in this middle portion the streams on the west, except for the Torver, are strike streams, but the streams on the east seem to be mainly at right angles to the outcrop, at least in the upper parts of their course. This action is illustrated in the diagram, where a stream, AB, flowing in a rocky valley, encounters rocks at B, whose lines of bedding, CD, cause the stream to be deflected to the right instead of to the left.



This is probably caused by the boulders which are hurled down the stream in floods, and then the jointing of the rock enables blocks to be driven out in a direction at right angles to CD. There is a case of this in the Glenridding Beck above the village of that name. If this consideration and reasoning are correct, it follows that in a district where there are regular well-marked bedding planes spread uniformly over a considerable area, and where the streams are sufficiently rapid, as is the case with the Upper Silurian rocks of the south part of the district, there will be a tendency for the streams to affect two main directions at right angles to each other, viz. the strike lines and the lines at right angles to these. The area on both sides of Coniston seems to bear this out.

The deltas of these lakes are an interesting feature. They add in a considerable degree to the variation of the shore-line, and in some cases they give a series of graceful curves, such as those formed by the deltas of the Scalehow and Sandwick Becks on Ullswater. On the other hand, they sometimes tend to create uniformity of outline by filling up re-entrant angles of the shore-line as in the cases of Glenridding and Glencoin on Ullswater.

During the examination of the lake shores which led up to a paper in the *Geological Magazine* of July 1926 on " Delta Formations in the English Lakes," it was found that the deltas generally present well-marked constant features, of which the following are the chief :

1. The outline is semicircular.

2. Where there is a predominant surface wind and a good expanse of water to windward, the stream through the delta curves towards the wind even when this means that it curves to the head of the valley. The predominant wind is not necessarily what meteorologists would call the prevailing wind of the district, but it is that wind which has the greatest effect in making waves do certain work for the place in question. It depends mainly on the aspect and surroundings of the particular places.

3. The edge of the delta in such cases is sometimes higher in the windward half of the delta than it is in the leeward half.

4. There is often a low-lying portion of the leeward half which is subject to be waterlogged in wet weather.

The explanation of these features seems to be as follows :

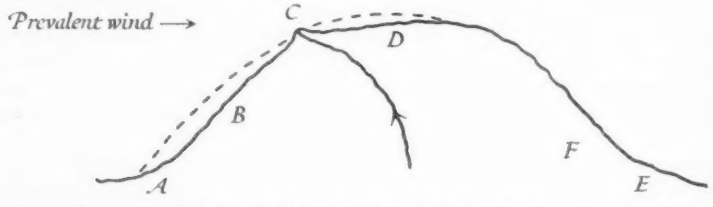
1. The delta has mainly grown in extent and depth by overflow flood action directed from some point generally in the medial line.

2. The predominant wind, by driving flotsam and jetsam in the stream over to the leeside of that stream, has built the leeside up, and driven the stream to windward. The waves of the lake have this action only at the actual mouth of the stream.

3. Small material brought down by the stream is carried past the mouth and drifts along the front of the leeside, thus helping to build up a beach and make the leeside have a hollow waterlogged portion in wet weather.

4. The action of the waves on the windward side has eaten off a considerable segment, which accounts for the cliff-like edge of the delta in the windward half.

The main features of such a typical delta are shown in the figure and are these : A small cliff of a few feet high at B gradually diminishes in the directions towards A and C. It again rises from C slightly to D, and then diminishes to water-level at E. A low-lying part exists at F, which is often waterlogged or actually a pool. The dotted line shows the portions eroded by the wave action under the force of the predominant wind.



Another feature about the bigger deltas is that the greater part of each seems quite dormant, while only a smaller subsidiary delta is growing at the mouth of the stream. It seems as if the main delta has been built up in the past, possibly after the Glacial Epoch, when streams were working on a bigger scale. Here and there a delta is found which is absolutely dead, and where there is no stream at all. There is an example of this on the east side of Ullswater, nearly opposite Glenridding. The descendant of the stream which built the delta has gone underground, and in places it can be heard below the ground when there is heavy rain, but in addition some of the water has found a drainage farther towards the south.

Bassenthwaite

Above the lower end of the lake there is a wide flat gravelly shore, with bushes blown over from the west-north-west. All this end of the lake-shore is very uninteresting as shore. Farther on, clay and old shore-gravel banks make a wide stretch of land with boggy patches just above the water. The mouth of a stream is a regular marsh, as it forms an unapproachable bulge into the lake covered with herbage and bushes. Numberless cut-runners drain the pasture land behind. This long strip of low-lying boggy woodland has been formed by earthwash from the land, and gravel from the wave action of the lake.

Halls Beck has built out a big pointed delta where there are beautiful wide shelving beaches of Skiddaw Slate shingle. Old grassy gravel mounds lie behind, with trees bent over as mentioned before. There is a great amount of débris driven ashore from the north-west.

Scarness is a curiously shaped boulder-clay projection. It has well-marked old lake banks above the present water-level. The next stretch is of the Watermillock type. On the first part of Broadness there is a wide shelving shore with grass to the water edge. There are boulders of the Glencoin type on the next portion. There is a well-marked older lake bank apparently running all round Broadness, so that it must have been a drumlin island at a date not very distant geologically. There is a big, wide, flat, and boggy area behind Broadness, and between it and Bowness.

Buttermere

Sour-milk Gill descends to the valley exactly at the north-west corner of the lake, where the stream makes its exit, and it has built a steep granophyre delta which has pushed the stream over to the east, and which contrasts with the Skiddaw Slate gravel on the east bank. An old higher lake margin is next visible, and then the bank is boggy again owing to the presence of boulder clay. There is a good beach bounded on the south by a rocky point of strongly glaciated tuff, which lies just north of Horse-close Delta.

The great beaches at the head of the lake are very well worth attention. At the mouths of the two Becks the beach sinks to water-level, but between the two mouths and to the east of Gatesgarth Beck the powerful wave action has built up beaches 6 feet above the level of the lake. The materials vary remarkably. Between the mouths, and to the east of Gatesgarth Beck mouth, the beach is nearly all Skiddaw Slate, but around the mouth of the latter beck this rock nearly disappears. Yet the Gatesgarth Beck runs over more Skiddaw Slate ground than the Warnescale Beck. Probably the explanation is that the Gatesgarth Beck runs through a valley filled with redistributed morainic matter which must have come from the Borrowdale rocks to the south. In this Gatesgarth valley three sets of terraces can be made out in places, of which the upper one is an almost unnoticeable shelf on the fellside, but in which the bedding can be well seen in a gravel quarry.

Hassnesshow Beck has built a very fine delta. The stream mouth is well on the north or windward side. There is a curious pointed corner, which reminds one of the similar growths on the Measand and Aira Beck

deltas. Small fragments are carried along the delta front by wind and wave action, and lodged on this projection. There are a few boulders lying on the delta near this point, and these probably have helped in the growth of this little low projection of shingle. These boulders and some others in similar positions present an interesting problem. How did they come to be where they are? They could not have rolled down, as there is nothing for them to roll down on a flat delta. They could not have been extracted from a matrix of boulder clay. Probably the explanation is that they arrived on or in floating blocks of ice when the lake was rather full and during the thaw after some very hard winter in the past. Such occurrences would doubtless be rare, but they might be sufficiently frequent to account for an occasional big boulder which looks as if it had dropped from Heaven on some delta front.

Coniston

The upper third of this lake has a great deal of alluvial land and some boulder clay on its shores. The lower two-thirds, from Hoathwaite Beck mouth to the south end, have much rocky shore. The rock is not continuous, but nowhere is there any great stretch where rock is not in evidence, and in many places it is uninterrupted for some distance.

The great area of alluvial land is near the mouths of Church and Yewdale Becks. The former has a very rapid course, and enters the lake from a bed which is noticeably above the level of the lake, when viewed from the lake. Enormous quantities of gravel are collected near these two mouths. The alluvial land stretches round the head of the lake, which is roughly walled or paved to resist the force of the waves in southerly gales. School Beck enters the lake here by a tiny artificial conduit, and looks insignificant in comparison with some noticeable old lake-shores and river-banks which stand back from the present shore and stream at a distance of a score or two of yards. The disparity makes one wonder if there has been some diversion of drainage farther to the north. It should be noticed that at the south end of the lake there is a big rounded hillock of boulder clay which may be part of a glacial dam causing variation in the height of the lake.

On the east side a small windward-trend delta is followed by a long flat bulge between High Bank Ground and Thurston. Black Beck comes down the middle of this and turns to windward at the mouth. Near Brantwood, in heavy weather from the south-west, huge quantities of gravel are piled up against the walls. There is a beautiful little shingle delta of the usual type, at the mouth of Beck Leven. After some stretches of boggy shore the rock becomes more noticeable, and Peel Island, High Peel Near, and Low Peel Near all run with the outcrop of the rock.

On the west shore one of the most interesting things is the presence of three Roman bloomeries. In two cases the banks of slag still modify the shore configuration. Torver Beck opens towards the head of the lake, but the stream has encountered a huge boulder or a piece of live rock on the right bank, which has given it this direction. Between Moor Gill and Hoathwaite Landing there is often continuous rock with a cliff of 10 to 15 feet high, and a jagged rocky beach where little ledges run diagonally across.

Before reaching Land's Point, some walls show by their differential

deposits the drift along shore from the south. Land's Point is a promontory formed of boulder clay, and it has a fine set of boulders of the Glencoin type on its north side. There is a good beach here, which resembles all the Coniston beaches in being composed of the blueish-grey upper slates, very like the shingle on the Skiddaw Slate beaches.

Crummockwater

The walk from Buttermere village to Scale Force must be one of the boggiest in the British Isles. I think this is due to the earthwash and rank vegetation lying upon the top of a layer of boulder clay. The mouths of the two Ruddy Becks are lost in rush-grown swamps. The beach at this south-west corner of the lake has been already mentioned for its pretty colours arising from the pink granophyre and blue Skiddaw Slate. Scale Beck has built the roughest delta that one can see in this district. The surface is very uneven. Towards the middle of the protuberance the beach is almost wholly granophyre. It must be remembered in connection with beaches of mixed materials, that the harder gravel will last very much longer than the softer. The granophyre pebbles will see the extinction of many similar assortments of Skiddaw Slate pebbles.

Low Ling Crag is a very curious feature. Here a well-glaciated rock is tied on to the mainland by a spit of gravel lying just under High Ling Crag. It seems very likely that this spit of gravel has some more solid core to it, such as a ridge of boulder clay. Just north of the spit there is a tough clay with granophyre blocks in it. They can reach the lake at the Scale Beck delta, but those in the clay north of the spit will probably have reached their present position by glacial action. The beach north of Low Ling Crag is a contrast to the beaches south of it, because the amount of granophyre in it has greatly diminished. Just here occurs a big gully at the foot of which is a huge dry delta fan. After a well-glaciated point there comes, right under the steep Skiddaw Slate slopes of Melbreak, a piece of shore with a great number of granophyre blocks probably coming out of a pocket of boulder clay.

A rocky point with striations on it precedes a very fine beach banked up by wave action. A new type of shore is noticeable here, consisting for about a quarter of a mile of continuous dry delta fans of rubbish from the Skiddaw slopes of Melbreak. The slope is gentle at the edge, and the surface is dry and grassy, with stones here and there. A long spell of good beach leads to the sharp bend east before Peel. There is a fine beach in this rounded bay, with big granophyre blocks about. The rounded promontory which projects to the south-east of Peel has a cliff of 15 to 20 feet high, cut out of the Drift, and the whole corner is really a drumlin similar to those in the Derwentwater area.

The mouth of Park Beck and its delta front have concrete walls. After crossing the Cocker the steep slopes of Lanthwaite Wood are reached, and the boulder-clay fellside reminds one of parts of Thirlmere. Just south of the Boat House there is a considerable deltaic bulge. The steep slopes below Grassmoor give a succession of rough whin-covered fields, still further accidented by the precipitous watercourses down the fellside, and edged by a little cliff rather difficult of access.

Rannerdale Delta is a good example of the huge glacial delta. The stream has moved right off the old delta front, and now opens into the lake to the north through a small subsidiary delta. The stream cuts along the landward side of the old delta at a depth of 10 feet below the old surface, and it must lose a lot of its water by drainage into the loose deltaic land on its left bank. This delta is like the Sandwick and Aira Beck ones on Ullswater, in having the windward side higher than the leeward. Hause Point is the only place on this lake where the rock descends abruptly right into the water. The more or less level meadow north-west of Wood House is a deltaic growth built up by two small streams. Nether How, which is now embedded in the deltaic land between the lakes, must have been an island at no very distant period.

Derwentwater

This lake has large alluvial tracts at both ends. The Bathing House near the Keswick Landing Stages stands on a small drumlin of yellow boulder clay which is well exposed near the house. There is a small broken boulder here with beautiful striations on it. The drumlin is bitten into a small 4-feet cliff here by the wave action, and there are boulders of the Glencoin type. The rock at Friar's Crag is glaciated and the intrusive dolerite has created great dislocation. The junction of this rock with the Skiddaw Slate can be followed along the shore for some way, and in places the latter rock has been metamorphosed to a fine blue colour.

Between Friar's Crag and Stable Hills, the shore is very difficult of access, as the Brockle Beck delta is a reedy swamp. From Stable Hills southwards there is a cliff 7 feet high, washed out of boulder clay. Big boulders lie about, some well marked with striations. These striations show much better on the Skiddaw Slate when it is hard than on the Borrowdale rocks. At the corner of Scarfeclose Bay the cliff is 12 feet high, and is composed of boulder clay, with a wide shore strewn with big boulders. This part of the shore from Keswick to Scarfeclose Bay shows how rounded projections into the lake may result from drumlins, and how the bays are occupied by marshy land where the streams have found their way to water-level.

Cat Gill has built a biggish delta where the stream opens towards the head of the lake, with a much bigger half on the right hand of the mouth. There is a big delta at Ashness Gill. The stream here opens down the lake, and is building a new point on to the old delta. The corner of the lake by Watendlath Beck is very reedy and marshy.

Just above the bridge at Grange and on the left-hand side of the river there is a string of big glaciated rocks with beautiful striations. They have diverted the stream to the right, and lie along its left bank roughly parallel to the stream. Just upstream beyond the most southerly of these rocks there is a very low-lying marshy angle of the stream, and farther off on the left there are many moraine mounds occupying the space between the stream and the fell foot. It looks as if the river may once have run into Great Bay. If so, then the moraine blocked the course of the stream and the post-glacial river in lowering its course through the blockage encountered the hard glaciated rocks mentioned above and was diverted to the right, forming its

low marshy delta on the right of Great Bay. There is a clear run from the head of Great Bay up towards Grange.

Manesty Park shore consists of rocky promontories separated by marshy peaty valleys beautifully wooded. The promontories run out in the general direction of the strike of the strata, thus providing an example of shore scenery determined by structure. Along Brandlehow Park shore we have many glaciated promontories of Skiddaw Slate, and also many boulders of the Glencoin type, from the superincumbent boulder clay. It is noticeable that in many cases here the glaciated boulder is actually lying perched on the glaciated rock. Just before reaching Otterbield Bay there is an open morainic grassy field edged by a typical beach of the Glencoin type, with a regular line of great rounded boulders 3 to 6 feet across, lying on a beach of small blue-grey Skiddaw Slate gravel.

Ennerdale

It is worthy of note that Bassenthwaite and Ennerdale, which are the two big lakes most easily assailable by Scotch ice, are the only two which have such a noticeable bulbous expansion at the distal end. Above Ennerdale there is a great length of alluvial valley probably marking a former extension of the lake, where the stream has made and re-made the materials of the drift-filled valley. The untouched boulder clay stands up steep above the levelled part. Just before the head of the lake, Woundell Beck has built a huge alluvial fan which has driven the Liza against the north-east side of the valley. As one goes along the north-east side of the lake, the mouth of Smithy Beck, with its tumbled bracken-covered delta, is soon reached, where there is an ancient bloomery with old slag heaps, and where the stream turns to the valley head. The beaches here are quite reddish with the quantities of granophyre.

Another delta at Dry Beck mouth leads on to a 6-foot cliff of remade boulder-clay materials. The current bedding is very frequent, and there is a great preponderance of rounded stones. Farther on this little cliff becomes a bluff of 12 to 15 feet, forming a kind of shelf projecting from the fellside towards the lake. It is marked on the Geological map as alluvial. There is no stream on the fellside to have built it. It seems to be a river formation and not a lake formation, and its materials seem to be those of the drift. As it could not be formed by river action while the lake was in its present position, this fluvio-glacial deposit must mark the bed of some river that preceded the lake, or of some stream associated with a valley glacier.

The big cliff at the corner where the high land recedes from the water at Bowness is well glaciated on the south-east, and perpendicular on the north-west. The great circular sweep from this point round to the Angler's Inn is a low alluvial shore built up by the deltas of Rake Beck and Gill Beck, and by a countless number of tiny little runners. The shore is embanked at the south-east end of this sweep, and also near the Inn.

Grasmere

Big rounded boulders lie about in the bed of the stream as it issues from the lake, and a big group lies on the middle of the beach at the south end of the lake. This is a fine beach 14 yards wide, and the boulders are remarkable for being all in a clump, many of them well rounded, and nearly all being

of banded ash or brecchia. On the west shore the woods soon give way to grassy fields of boulder clay with a reedy margin, where a wall shows no shore-drift either way. Nearly opposite the island there is an old lake margin 6 to 8 feet above the present line.

Here a rocky point is glaciated on the north. There is here a deltaic bulge where the runner has been covered in a conduit, the upper part of the field showing the hollow where the runner has cut away the boulder clay. The alluvial land at the head of the lake, and the road on the east shore, present little upon which comment is necessary.

Haweswater

There is a very great area of alluvial land at the head of this lake. The mouth of the Mardale Beck is now near to the eastern shore, but there is the trace of a former outlet of the stream near the western shore, and this former mouth has pushed the shore on this western side farther forward than the present mouth has reached on the east. The land near the old mouth is continuous with the delta built out by Whelter Beck. Turning the south-east corner of the lake we reach two deltas of the usual character, which lead on to Gurness Nib. This is a curious sharp point formed of huge boulders acting as a framework to protect the beach. They have been weathered out of the boulder clay in the usual way of the Glencoin type of shore.

The Drift Sheet of the Geological Survey containing Haweswater shows no boulder clay on the east side of the lake except for a small patch at the south-east corner. The whole valley is soon to be flooded for the thirsty people of Manchester, and as it is unlikely that the Sheet will be revised before that event, it is just as well to call attention to the fact that there is a great deal of boulder clay on this east side, probably quite as much as there is on the west side.

More boulders of the Glencoin type and some little beaches near the stream mouths occur on the shore which at Boulderstone Nib arrives at a delta-shaped grassy protuberance, which by its very name reveals its origin. The boulders line the shore, and there is an immense amount of driftwood sent ashore by the south-westers.

Beyond Wallow Crag we have a marshy margin to the lake where numberless tiny unnoticeable runners build up the shore with earth-wash. This provides a good example of the slow percolation type. Opposite Colby there is another projection exactly like Boulderstone Nib, protected by boulders and backed by a great whaleback of moraine lying at the foot of a huge concave wooded combe north of Wallow Crag. The Haweswater Nibs are good examples of the Watermillock type.

Near the north-east end of Low Water the east side of the lake is shallow, and when the water is low it leaves a wide shelf covered with boulders, mostly angular and of varying sizes from 1 foot across to about 8 feet. The shore is backed by moraine whalebacks. At the end of the lake near the Stepping Stones, the whole bed of the stream has been cut out of moraine.

Continuing round to the west side, we find Lord Lonsdale's Boat House on the lee side of a little stream which has built a small delta. Owing to the windward trend of the stream through the delta, the position of the house

Boredale, showing depth of drift

Beach at head of Buttermere

Low Ling Crag and shingle spit, Crummock Water

Mouth of Crummock Water

Boulders of Glencoin type, Ullswater

The head of Ullswater and Glenridding delta

is well chosen. The same feature and location occur with the cement harbour at the mouth of Ramps Beck on Ullswater. The Measand delta has its exposed side well guarded by small trees like many of the more important deltas, and doubtless all the protection that the roots can give is needed against the south-west gales. At the north-east end of the straits there is a curious point, as on the Aira Beck delta, which has grown by matter drifted along the front of the delta. From Measand to Rowan Park the shore-line is straight and uninteresting. There is boulder clay all the way, sometimes furrowed into ridges of small camber at right angles to the shore.

Rydal

The head of the lake is full of reeds. The south-west margin is formed by boulder clay. There is a roche moutonnée strongly glaciated from the west, and formed of tuff. Boulders of the Glencoin type lie on this south shore. About halfway along there is a considerable flattish delta with two runners, both opening towards the head of the valley. A bold bastion of solid rock which bounds the delta on the east is formed of tuff, and strongly glaciated from the west. Close to it is a beautifully rounded boulder clay promontory of the Watermillock type. At the south-east corner, where the lake narrows, there are rocky promontories well glaciated from the west, with reedy little bays in between. On the north shore there are first several rocky knolls of well-glaciated tuff. Along most of this shore there are reeds and marestails, the former reaching right out to Heron Island, to the east of which there is a prominent grassy bulge of boulder clay. At Nab Cottage the rock comes right down to the water edge. Towards the north-west corner there is a large expanse of alluvial matter, mainly rounded river stones.

Thirlmere

The 6-inch Map has not been revised since the level of the lake was raised, and this detracts from the pleasure of walking round the shores. In some parts these shores are more difficult to explore than those of any other lake, because the young trees planted by the Manchester Corporation are so dense, and so matted with briers, that passage in places is quite impossible. A great part of the east shore is composed of boulder clay, and the strong wave action is undercutting this, and great pieces fall in. The consequence is that the only way along the shore is sometimes by jumping from one piece of fallen boulder clay to the next. At times there is a steep cliff 6 or 8 feet high, with angular fallen boulders at the edge of the water.

These new boulder-clay beaches of Thirlmere are a perfect contrast to the Glencoin type. The boulders are not scattered on a wide level shelf, in fact there is no level shelf at all, and the bank behind has had no time to get worn down into a gentle slope. There are no beaches of pebbles at all just here.

Near Clark's Leap there are big boulders touching fine stratified gravel in the bank. The boulders may have been dropped by ice, and may mark an old level of the lake. Rocky points plastered with boulder clay succeed one another, and opposite Armboth there is a shoulder of polished glacier rock of big area. The grassy margin following this has a very curving outline, and there follows another projection of glaciated rock, even larger than the last.

In fact these glaciated rocks are amongst the best of the district, except that they do not show striæ.

Under Great How there is a cliff 24 feet high, of boulder clay resting on live rock, and showing in places signs of bedding of a sort. Much of the boulder clay on this east side of Thirlmere is like cement in its hardness. Just south-east of the rocky point opposite Raven Crag there seems to be a river-bed section consisting of 13 yards of rolled material, then a few yards of indefinite stuff, followed by 19 yards of rounded pebbles and boulders of all sizes up to 2 or 3 feet across. North of this point, and also near the dam, there are water-worn rocks, so that we may have here some old river-bed of the valley.

It has often been remarked that Thirlmere got over the rectilinear newness of its shores very speedily. This would be partly accounted for if the lake had only been restored to the old level that it occupied ages ago.

Remembering that beaches are the result of wave action, one would have expected from the position of the lake, that there would be better beaches on the east side than on the west. Quite the reverse is the case. There are hardly any beaches on the east, but there are quite a lot of well-developed beaches on the west side, commencing at the dam, and occurring at intervals halfway along the west shore. The explanation may be that the west side is naturally more shelving, and that the boulder clay is not of such a hard texture as on the east. On the west shore there is also quite a lot of masonry embankment, as if this shore was more vulnerable. It may be that the great pressure of ice on the Helvellyn range has made the moraine profonde on the east side particularly hard.

Two streams enter the water north of Armboth, and have made a little bay with a beautiful beach. In an old lake there would have been a delta here, but in the new lake it is a drowned estuary on a tiny scale. At Armboth, Middlestead's Gill and Fisher Gill had built such a large area of alluvial land that some of it has survived, and the deltaic matter has driven the two mouths apart from each other.

Near Hause Point the cliffs loom right over the water. There is a considerable stretch of the Place Fell type of shore, with huge boulders on the fellside which have fallen from the cliffs. A rocky promontory here is glaciated on the south, and rough on the north side. The shore of the drowned land near the City is very tortuous. The slopes above water-level again show the presence of boulder clay, and there are a few big boulders near the edge. On the top of Dunmail Raise, a corrom has been formed by Raise Beck, and Dr. Marr has pointed out that the steeper slope to Grasmere had drawn the water off to the south. The Waterworks engineers have now diverted all the water to the north, into the catchment area of Thirlmere. It is a pity that the Manchester passion for water should have spoilt such an interesting illustration of geographical principles.

Ullswater

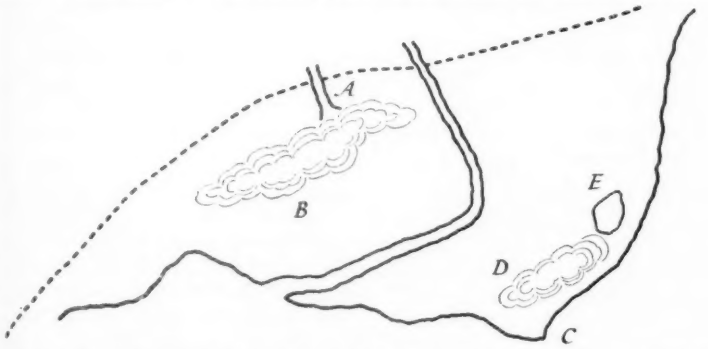
The head of Ullswater is very square and formed of alluvium. The Grisedale and Goldrill Becks join before entering the lake, but their junction was brought about only by artificial means quite recently. A hundred years ago Grisedale Beck opened direct into the lake. Possibly the absence of a

beach at the head of Ullswater has to do with the fact that both the becks have filled up old lakes, one in Grisedale Valley, the other above Patterdale. Consequently the streams would have reached Ullswater in the past without the usual amount of alluvial matter. The greater part of the upper reach of the lake, apart from the head and the big delta of Glenridding, has a rocky shore.

The lavas and tuffs from Stybarrow to Glencoin give a very bold and varied shore-line which has a number of well-marked glaciated rocks. Several great rolls of such rock run up the fellside from the shore. This particularly beautiful piece of shore scenery has for some time belonged to the National Trust, which, through a patriotic local effort, has now acquired the woodland behind.

The middle reach of the lake is remarkable for the uniform straight lines of the two parallel sides, which are often cited as a good example of the planing and gouging action of the ice in glacial times. The actual straightness of the east shore may be partly due to the fact that the direction of this middle reach is parallel to the outcrop of the Borrowdale rocks which dip to the south-east.

The Glencoin Park shore has been fully described, but Aira Beck Delta deserves some notice. The curious turn of the stream to windward is most

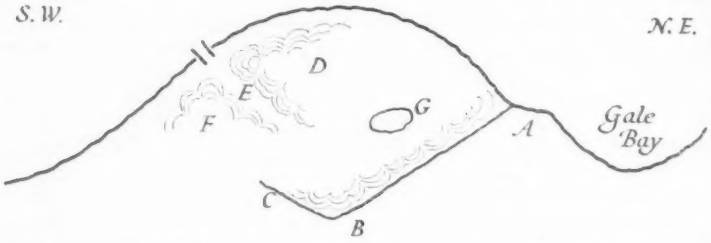


striking. There seems to have been an old stream course at A. There is a noticeable dip here which causes the 500-feet contour on the map to swerve. There are great shingle banks at D, showing two ramparts, but the inner one is grown over with vegetation in places, and seems to have been properly embanked. A considerable dip in the shingle occurs at E, such as may easily happen when two ranks of shingle are built up by waves. The point C has grown by along-shore drift from the mouth. The whole front is well consolidated by the growth of alders and other small trees. In wet weather the water lies on the leeward side.

At Skelly Neb we enter on the third reach of the lake, and the greater part of the west shore now consists of the Watermillock type. There is a beautiful succession of graceful curves formed by the weathering and moulding of the boulder clay. Old Church Bay may be mentioned as typical of this scenery, which lacks the grandeur of the southern end of the lake, but

which is exceedingly beautiful nevertheless. At Castlehows Point the united waters of the Longthwaite and Pencil Mill Becks are building out a projection which illustrates the windward trend. Since the Glencoin and Watermillock types both depend on the presence of boulder clay, we would expect the symptoms to be sometimes combined, and along this piece of the shore we have several notable groups of boulders. In particular there is a fine group of brecchia boulders at the south-west corner of Skelly Neb, and north of Rampsbeck House there is such a fine set of boulders that they are even shown on the 6-inch map. Towards the end of the lake the shore is marshy and covered with rushes and marestails. Then we reach the rocky shore formed by the Basement Conglomerate which lasts round to Aik Beck, except for the two interruptions at the old pre-glacial exit and at the present Pooley exit.

Between Aik Beck and Gale Bay there are three confluent small deltas all showing the windward trend, and in which the right-hand sector of the delta is to the left-hand sector as 2 : 1. The two southern deltas are now practically dormant. Then we come to a most interesting semicircular

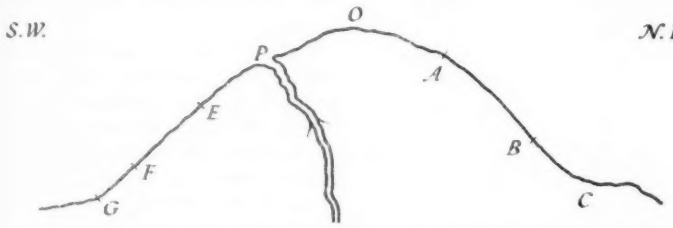


protuberance which is labelled a Crannog on the 6-inch map, the higher part of which is called Hodgson Hill. I have so far been unable to find any account of this spot in the archæological records of the county. Before being adapted by man, it was evidently a very delta-like moulding of the boulder-clay. The configuration is as follows: Along the east side AB a good ditch 3 yards wide has been cut which turns the angle at B and runs for a short way to C. D is a good mound which stands 20 feet above the water-level. There is a dip at E between this mound D and another similar one slightly smaller at F. Advantage has been taken of this arrangement to run the steamer ashore on rails and let it stay in E. At G there is a pool with willows.

Thwaitehill Neb has already been referred to. The south-west side is exposed to very strong wave action. It has consequently been greatly eroded, and it shows boulders on the shore. At Howtown there is one of the largest bays in the Lake District, and it has at its end a great area of boggy alluvial land. When we turn Geordie's Crag we enter on the rocky shore of the middle reach, and are in fine Borrowdale rock scenery.

In Sandwick delta the stream turns well to windward. The windward side is noticeably higher than the leeside, which, as at Scalehow, has a slightly greater protuberance on the leeside. The leeside is very subject to flooding in wet weather. Great pools often stand on it. The height of the

edge of this delta and the nature of the beach have both points of interest. Along EF the height of the delta front is about 8 feet, diminishing to 5 at G. The height of the beach at O is 4 feet, rising to about 6 at A and then diminishing. At B there is no height at all as the grass advances to the water edge. To the right of the mouth there is a good beach of stones which farther on at A becomes fine gravel. The amount of fine gravel on the right hand of this delta about A is most remarkable. A wall at A running at right angles to the margin shows 3 feet more depth of gravel on the south-west side. It also shows gravel advancing 4 feet farther into the lake



on that side compared with the north-east side. Along PE there is very little shingle, but all the stones are bigger. At E a small wall shows no difference on either side.

These facts show that there is practically no drift along shore on the windward side of the delta, but that there is a great amount of drift along the shore of the leeside of the delta, and the material must come from the stream mouth itself. All the material is thus drifted along to the north-east before the prevalent south-west gales. But the amount of material that is in sufficient quantity to be noticeable on a beach in the shape of gravel or shingle very soon ceases at any considerable distance from the stream mouth.

Two walls between Sandwick and Scalehow deltas show by their differential deposits that there is a good deal of drift down the lake here. The windward side of Scalehow Beck delta stands 10 feet above water. There is a triangular patch of Skiddaw Slate between Hallin Fell and Long Crag. It is deeply covered with boulder clay, and Scalehow Beck has dug a deep valley through this clay, and built one of the typical Lakeland deltas.

The rocky shore to Silvery Bay from Long Crag under the steep cliffs of Birk Fell is monotonous in its lack of variations, but the birch woods and the mountains around made the cliff path one of the most beautiful walks in the Kingdom. Along this considerable stretch there are no streams and no beaches. The mountain side descends steeply into the water, often falling away in screes. The boulders along the edge and on the fell side are all angular and have fallen from above. The trees, which are mainly birches, run right down to the water edge. This kind of margin, with rock to the water, a steep cliff giving crowded parallel contours on the map, and angular boulders above and below water with a complete absence of beach, is the best example of the Place Fell type.

Purse Bay is a very picturesque and interesting corner. The spur of land protecting the bay is of an extraordinary shape. C is a huge block

of very hard lava strongly glaciated and now covered with pine trees. There is a dip and constriction at A through which the water passes when high. D is another big block of round glaciated rock, and B is a low gravel spur with beaches on both sides, completely submerged at very high water and bearing fine conifers right down to the water. The whole of the land at E is deltaic, so that Purse Bay is only the remnant of a much bigger opening.

I should like to express my gratitude to Mr. Sandham, the resident Engineer of the Manchester Water Works, for his permission to explore the shores of Thirlmere; and to all the private owners to whom I have had to apply for permission to visit their grounds on all the lake-shores. They have been invariably kind.

DISCUSSION

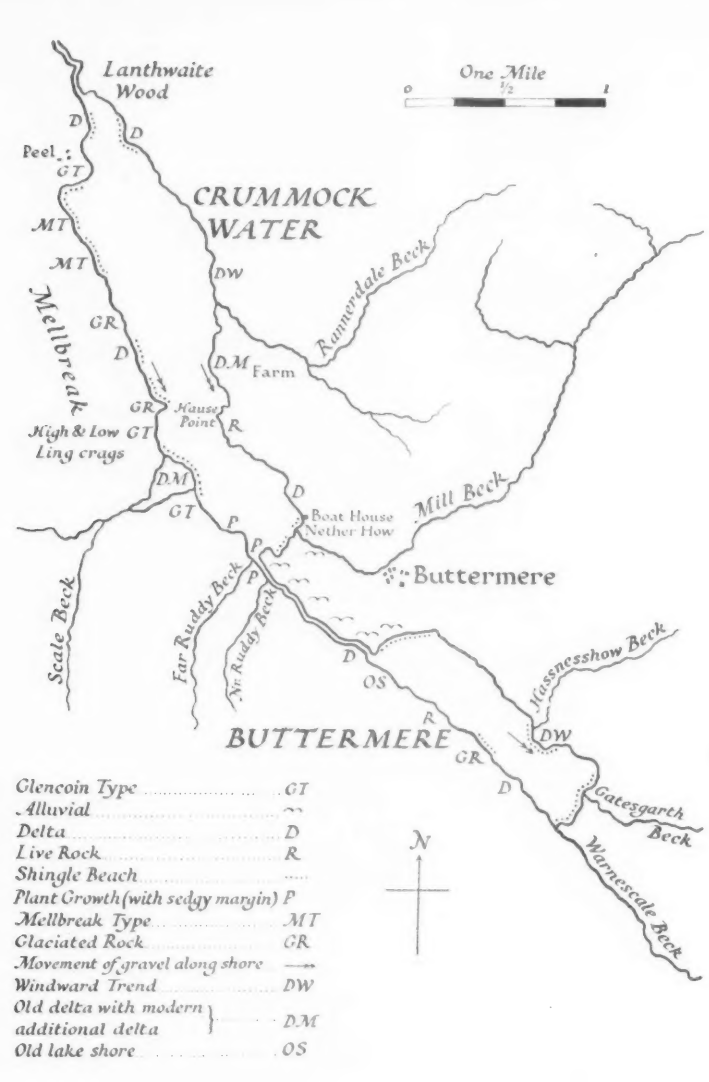
Before the paper the PRESIDENT (Colonel Sir CHARLES CLOSE) said: Mr. Thomas Hay, who is going to give us a paper this afternoon on "The Shore Topography of the English Lakes," is the headmaster of King Edward VI School at Chelmsford. I understand he has a holiday cottage in the lake district, and that he has taken up the study of the physical geography of the lake-shores as a hobby. I have had the privilege of reading the proof of Mr. Hay's paper, and I find that there is a good deal of very interesting new matter in it. I will ask Mr. Hay to commence his lecture.

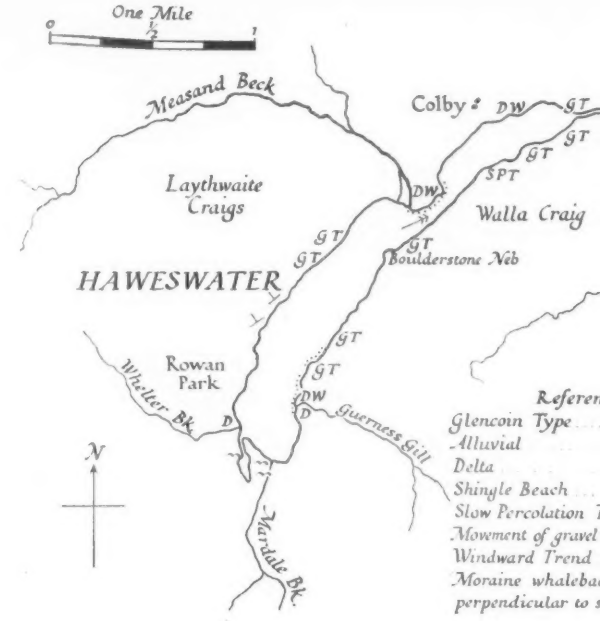
Mr. Hay then read the paper printed above, and a discussion followed.

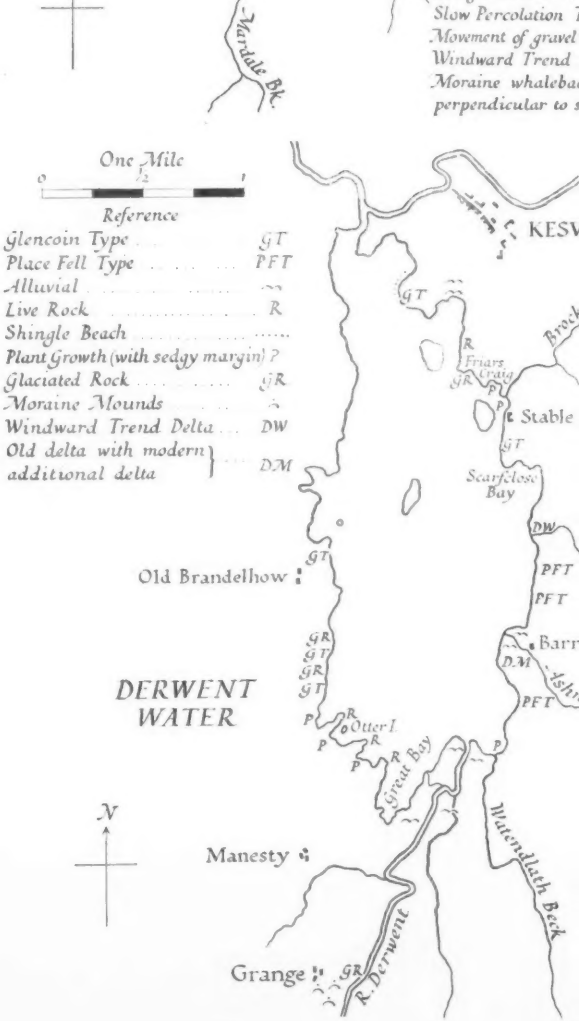
Dr. H. R. MILL: It has been a great pleasure to me to hear this admirable lecture, and I must congratulate Mr. Hay on the way in which he has described his very detailed observations, avoiding technical expressions and getting at the geographical principles which were elucidated by observations which were to a large extent geological.

My conception of geography, supported by the general opinion of modern geographers, is that it deals fundamentally with two different conditions: one, the forms of the crust of the Earth as they are at the present time; the other, the function which those land-forms perform with respect to what I have termed mobile distributions. In other words, the forms of the land guide the movement of movable things upon the surface. The world is a going machine, worked by the energy of the sun, which is brought into contact with the surface through streams of air, streams of water and streams of solid matter creeping down the slopes. As Mr. Hay has shown, all of these conditions working together are gradually carving and moulding the forms of the land, so that the function which they perform is always altering them, and so, in time, modifying the function itself.

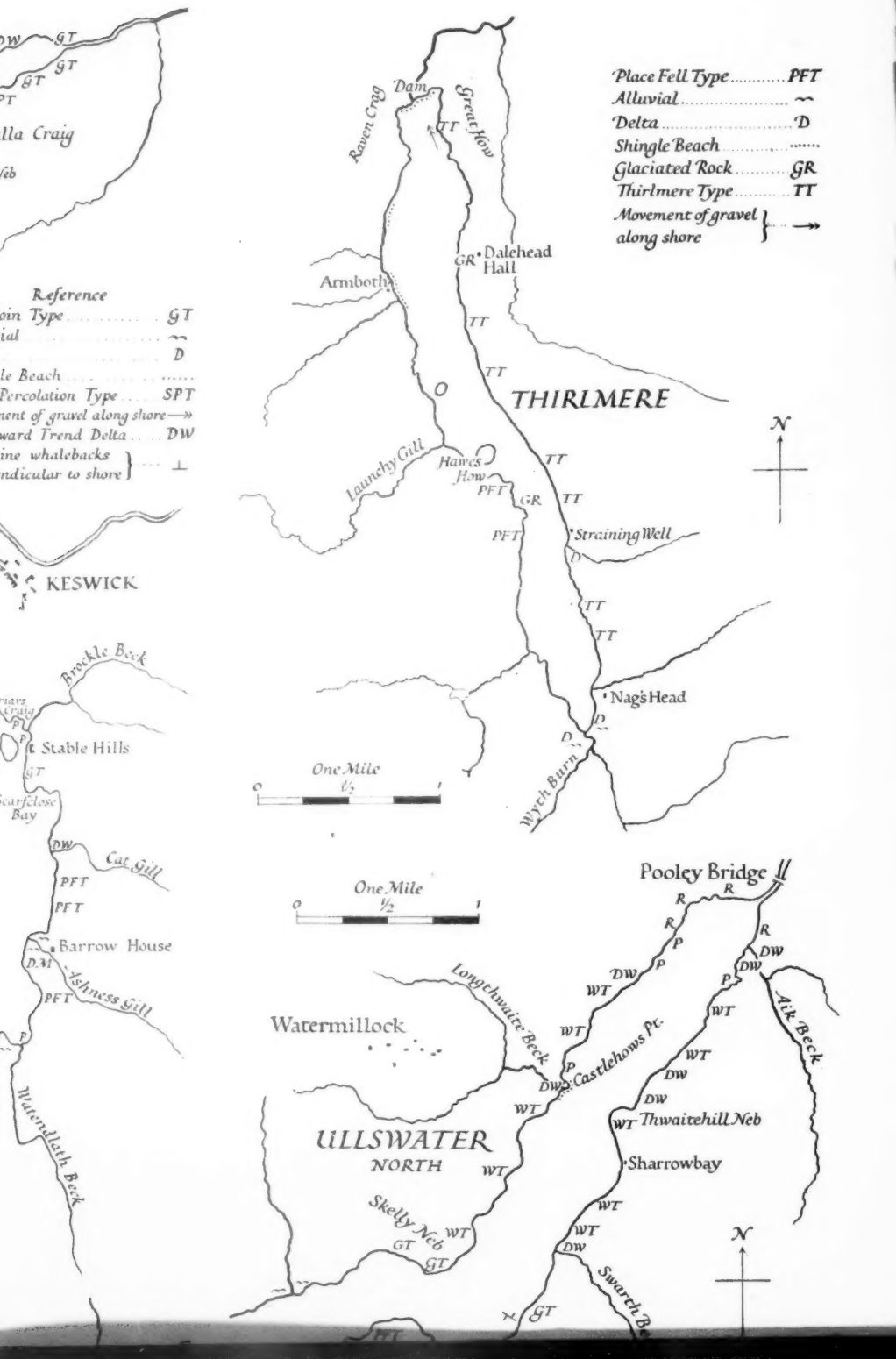
The lecture has recalled vividly the happy time that I spent thirty-five years ago with my wife and Mr. Heawood sounding the depths of those lakes, practically for the first time. Then we were concerned only with the configuration of the bottom of the lakes, and the deltas and promontories and

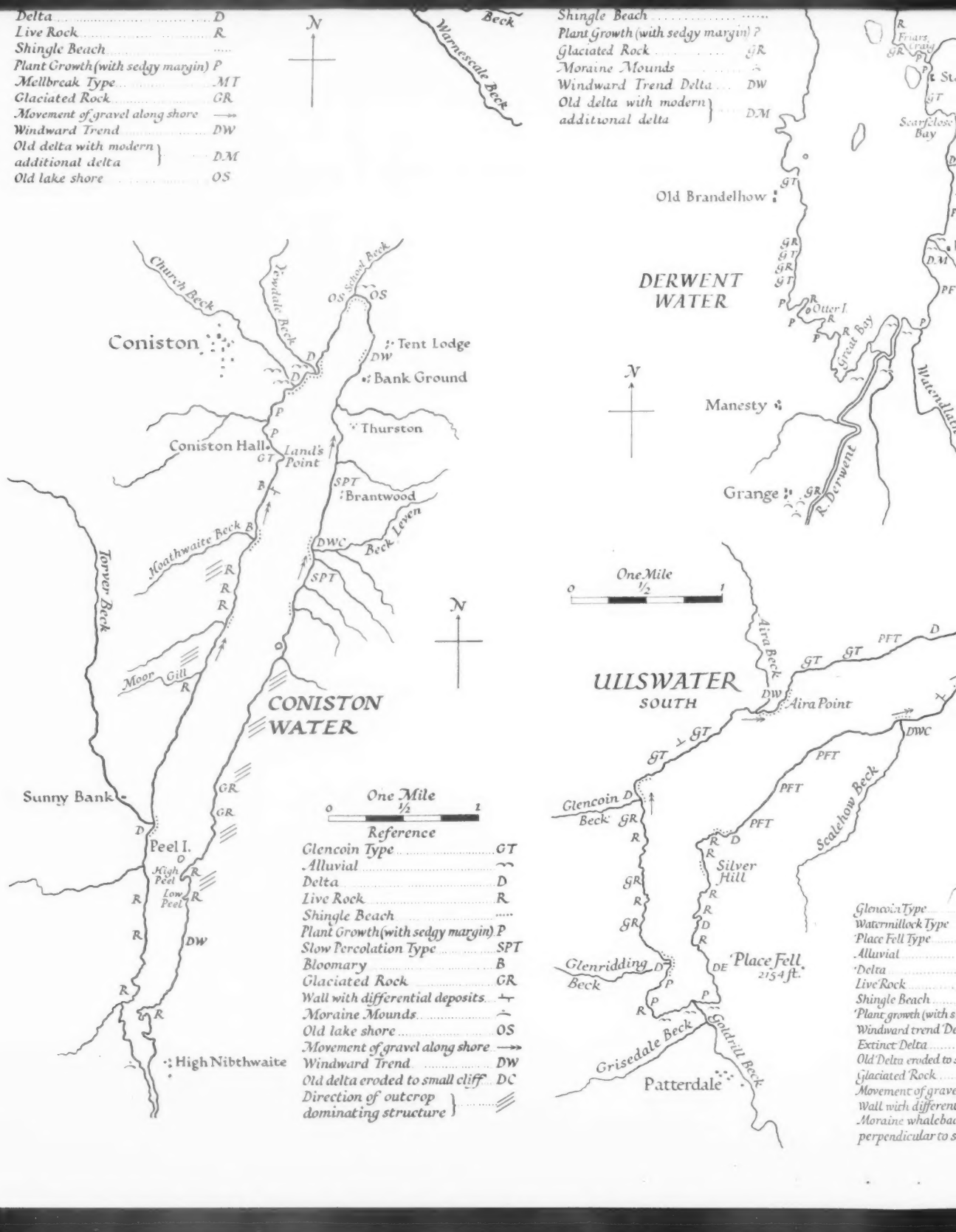

Lanthwaite Wood
One Mile
0 ½ 1
Peel
CRUMMOCK WATER
Melbreak
High & Low Ling crags
Hause Point
D.M Farm
Rannerdale Beck
Mill Beck
Boat House
Nether How
Buttermere
Scale Beck
Far Ruddy Beck
Nr. Ruddy Beck
Hassnesshow Beck
BUTTERMERE
Gatesgarth Beck
Warnescale Beck
N
Glencoin Type ..... GT
Alluvial ..... ~~
Delta ..... D
Live Rock ..... R
Shingle Beach .....
Plant Growth (with sedgy margin) P
Mellbreak Type ..... MT
Glaciated Rock ..... GR
Movement of gravel along shore →
Windward Trend ..... DW
Old delta with modern additional delta ..... D.M
Old lake shore ..... OS

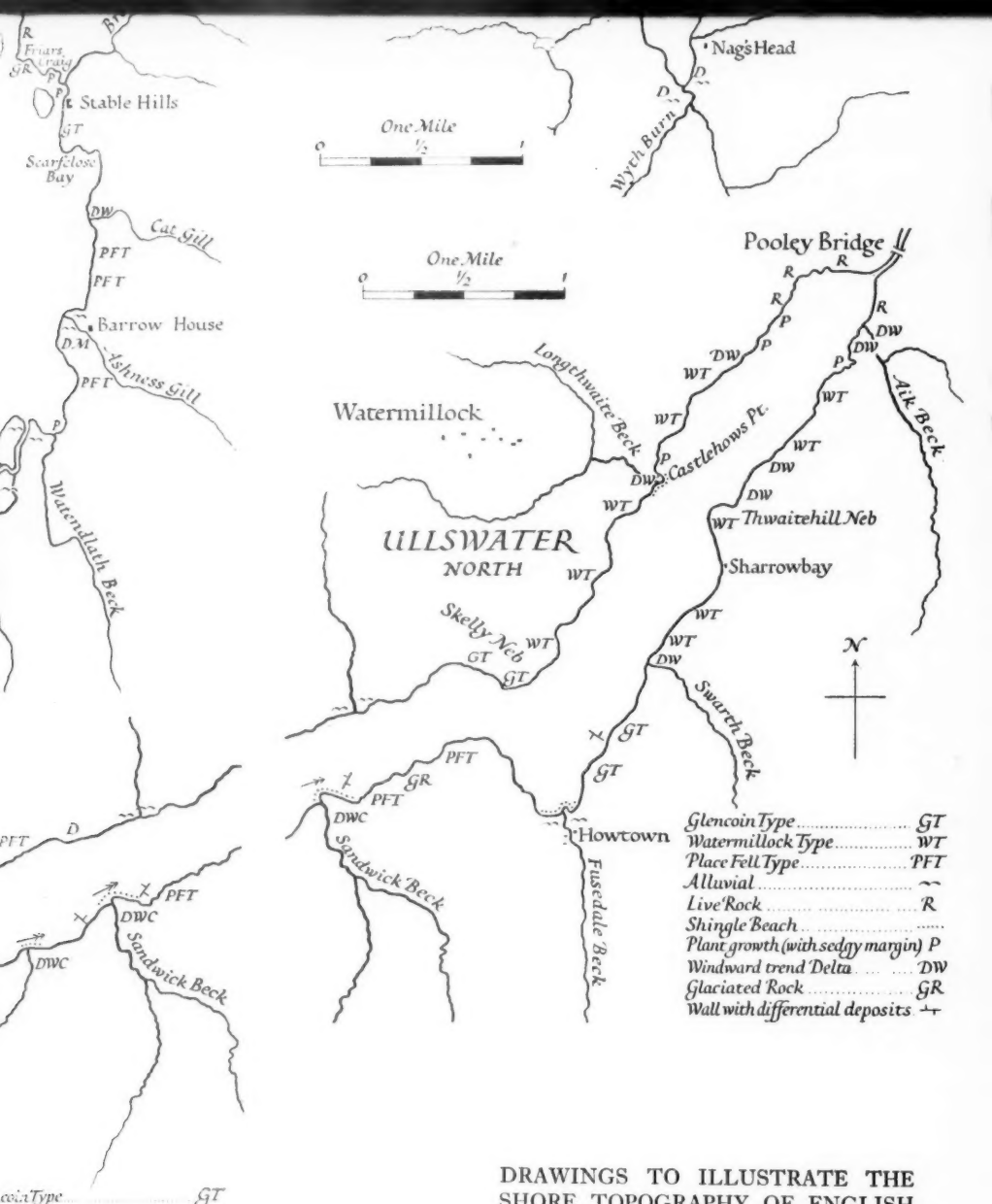

One Mile
0 ½ 1
Measand Beck
Colby
Laythwaite Craigs
Walla Craig
Boulderstone Neb
HAWESWATER
Rowan Park
Wheller Bk.
Guerness Gill
Mardale Bk.
N
Reference
Glencoin Type
Alluvial
Delta
Shingle Beach
Slow Percolation
Movement of gravel
Windward Trend
Moraine whaleba
perpendicular to


One Mile
0 ½ 1
Reference
Glencoin Type ..... GT
Place Fell Type ..... PFT
Alluvial ..... ~~
Live Rock ..... R
Shingle Beach .....
Plant Growth (with sedgy margin) P
Glaciated Rock ..... GR
Moraine Mounds .....
Windward Trend Delta ... DW
Old delta with modern additional delta ..... D.M
KESW
Friars Craig
Stable
Scarfclose Bay
Old Brandelhow
DERWENT WATER
Otter I.
Great Bay
Manesty
Watendlath Beck
Grange
R. Derwent
N

Church Beck
Yewdale Beck
OS School Beck
Coniston
Tent Lodge
Bank Ground
Thurston
Coniston Hall
Land's Point
Brantwood
Beck Leven
Monthwaite Beck
One Mile


Place Fell Type ..... PFT
Alluvial ..... ~
Delta ..... D
Shingle Beach .....
Glaciated Rock ..... GR
Thirlmere Type ..... TT
Movement of gravel along shore
Reference
Type ..... GT
ial ..... ~
D
le Beach .....
Percolation Type ..... SPT
ment of gravel along shore —»
ward Trend Delta ..... DW
ine whalebacks
ndicular to shore
Raven Crag
Dam
Great How
Dalehead Hall
Armboth
THIRLMERE
Launchy Gill
Hawes How
Strcining Well
Nag's Head
Wyth Burn
KESWICK
Brockle Beck
Stable Hills
Scarfclose Bay
Cat Gill
Barrow House
Ashness Gill
Watendlath Beck
One Mile
Pooley Bridge
Longthwaite Beck
Watermillock
Castlehows Pt.
Aik Beck
ULLSWATER
NORTH
Thwaitehill Neb
Sharrowbay
Skelly Neb
Swarth Be
N


Delta D
Live Rock R
Shingle Beach .....
Plant Growth (with sedgy margin) P
Mellbreak Type MT
Glaciated Rock GR
Movement of gravel along shore →
Windward Trend DW
Old delta with modern additional delta DM
Old lake shore OS
N
Warnescale Beck
Shingle Beach .....
Plant Growth (with sedgy margin) P
Glaciated Rock GR
Moraine Mounds
Windward Trend Delta DW
Old delta with modern additional delta DM
Friars Crag
Scarfeloss Bay
Old Brandelhow
DERWENT WATER
Otter I.
Great Bay
Manesty
Grange
R. Derwent
Church Beck
Lewdale Beck
OS School Beck
Coniston
Tent Lodge
Bank Ground
Thurston
Coniston Hall
Land's Point
Brantwood
Hoathwaite Beck
Beck Leven
Tower Beck
Moor Gill
CONISTON WATER
Sunny Bank
Peel I.
High Peel
Low Peel
High Nibthwaite
One Mile
Reference
Glencoin Type GT
Alluvial
Delta D
Live Rock R
Shingle Beach .....
Plant Growth (with sedgy margin) P
Slow Percolation Type SPT
Bloomary B
Glaciated Rock GR
Wall with differential deposits
Moraine Mounds
Old lake shore OS
Movement of gravel along shore →
Windward Trend DW
Old delta eroded to small cliff DC
Direction of outcrop dominating structure
One Mile
ULLSWATER SOUTH
Aira Beck
Aira Point
Glencoin Beck
Silver Hill
Scalehow Beck
Glenridding Beck
Place Fell 2154 ft.
Grisedale Beck
Goldrill Beck
Patterdale
Glencoin Type
Watermillock Type
Place Fell Type
Alluvial
Delta
Live Rock
Shingle Beach
Plant growth (with s
Windward trend De
Extinct Delta
Old Delta eroded to s
Glaciated Rock
Movement of grave
Wall with different
Moraine whalebac
perpendicular to s



DRAWINGS TO ILLUSTRATE THE SHORE TOPOGRAPHY OF ENGLISH LAKES *by Thomas Hay*

Geographical Journal July 1928

UNIV. OF MICH.

bays were studied by us only as convenient points for attaching our lines of soundings to the coast-line on the 6-inch maps. But even so, many features impressed themselves upon our attention, and particularly that one with which Mr. Hay commenced his lecture—the curious arrangement of the boulders along the margin of the lakes. On the east side of Haweswater the line was particularly pronounced because all the stones were white as if they had been whitewashed like the edge of a railway platform. That whitening of the stones may perhaps be of some importance with regard to the origin of the features. It may be due to the deposit of something on the surface from the water, or it may be due to the removal of something from the surface of the stones by some other chemical action. It is a well-known fact that in peat mosses the stones are always bleached and whitened by the action of humic acid upon the oxide of iron which usually gives colour to stones. It strikes me as being worth inquiring whether those flat beaches may, at some time after the glacial moraine had been eroded away, have been covered by peat bog which bleached the stones and was subsequently removed. I offer the hint to Mr. Hay for his consideration when he next visits that region.

With regard to the origin of the deltas, especially those deltas in which the river faces up-lake, I feel that I should like to discuss the matter a good deal more fully before being quite satisfied in my own mind as to the actual mechanism by which the result is produced. Of the fact there can be no doubt whatever. As to some of the more permanent deltas, such as the Measand delta, I have been led to wonder whether they have been produced by a gradual process of accumulation of silt brought down by the streams, or whether the greater part of the work of construction might have been due to some particular catastrophe. There are many places in the lake district, in the mountains of Wales and elsewhere, where we know that a great gash or gully cut in a hillside with a rush of alluvial deposit fanning out below was produced by one of those tremendous rainfall phenomena known as cloud-bursts, and the feature produced in a single day has persisted for one hundred years or more without being very markedly modified by the ordinary forces of erosion. At Haweswater above the Measand delta, the Measand Beck flows down through a gorge from a valley containing what struck me at the time—I do not know whether geologists have confirmed this or not—as being an old glacial lake now dry, forming a flat expanse which would be a meadow in a more genial climate. The breach in the moraine barring it looked as if it might have been cut through by a cloud-burst or something of that kind, sending an enormous rush of material down the beck which almost filled up the section of the lake opposite it. The Measand delta is an enormous feature compared with the size of the lake in which it is formed and to the beck which crosses it. The alluvial flat which separates Buttermere and Crummock Water and the still more extensive plain which separates Derwentwater and Bassenthwaite, both probably originated by the formation of deposits in what were once single lakes, but in both cases the streams are larger or more numerous.

Now, I hope sincerely that Mr. Hay will be encouraged by the appreciation which I am sure all geographers will show of this extremely interesting study of his to go on and extend it to the remaining lakes. When he goes to Windermere he will be brought face to face with the remarkable extension of flat land at the head of that lake by the formation of deltaic land so rapidly that it will be possible by comparing maps of different dates to trace the rate at which the growth has occurred, and there on the delta at the head of Windermere I think he will find perhaps the best examples of wave erosion on a deltaic coast that are to be found in the district.

I have to thank Mr. Hay for giving me a particularly pleasant afternoon. There is an immense deal of real geographical research, one might almost say geographical exploration, still left to be done in our own country, and it is one of the great functions of the Royal Geographical Society to encourage and foster such work, and it is one of the great functions now of geographical chairs in our Universities to raise up geographers who will be prepared and willing to carry on researches of this kind. It is extremely to the credit of Mr. Hay that he should have carried on the work so far as he has done, entirely unaided, and I hope that he will be able to continue it and let us have the pleasure of another interesting report.

The PRESIDENT: Mr. Hay in his paper mentioned that he was in some difficulty in regard to Thirlmere because he was unable to get an up-to-date Ordnance map. Perhaps Colonel Jack would like to say something about that.

Colonel E. M. JACK (Director-General, Ordnance Survey): I am very glad of the opportunity to say how much I have enjoyed Mr. Hay's paper. I have nothing to say on the subject of topography, but I would like to make two remarks on the subject of Ordnance maps. In the first place, it is quite true that the map of Thirlmere is thirty years old. We try to observe the rule on the Ordnance Survey that our large-scale maps shall not be more than twenty years old; that is to say, we endeavour to revise them once every twenty years. The reason that the map of this part of the world is so old is that owing to post-war economies our staff on the Ordnance Survey has been cut down so much that we have had to cut out the revision of the more sparsely populated areas. It is very regrettable from the map-maker's point of view, but we have to accept it as a painful necessity. Instead of doing the revision of these less-populated areas every twenty years, we are going to do them at present only every forty years, so that this particular area has to wait for another ten years. That is the sole reason: reduction of staff; post-war economies.

One other point due to a remark the lecturer made to me in the few minutes' conversation I had with him before the lecture. He said what he had felt rather more than any inconvenience owing to the fact that the large-scale maps were out of date was the lack of a map between 1-inch and 6-inch. Now that is a very interesting comment to make, because in this country we have the most comprehensive range of maps of any country in the world, ranging from 16 miles to the inch to the large scale of 25 inches to the mile. It is interesting to hear that some one finds that even that range of maps is not quite complete enough! Mr. Hay said he would like a map 3 inches to the mile. So would I. I have sometimes felt the need of a map of that scale. It would be very useful. But there again it is simply a matter of practical politics. I doubt if we could have done it with our old and larger staff. We could not think of it at the present time. Each extra series of maps means that that map has to be kept up to date, and that means increase of staff; therefore it is quite impracticable, however interesting and useful such a map would be, to consider it at the present time.

Mr. J. H. REYNOLDS: One of the lakes not mentioned was Wastwater, which runs from north-east to south-west. The prevailing south-west wind must drive up it with great force at times, so that you would expect to find one of those beaches at the upper or north-east end such as you find at the head of Buttermere. While I have not actually been on the spot, I have looked down on it, and I do not remember any beach there, though there is a very good beach at the south-west end of the lake in what would be a comparatively sheltered position. Another lake not mentioned was Esthwaite Water, which

would probably repay Mr. Hay's attention, as it has a very indented outline. Some of the larger tarns such as Elter Water and Sprinkling Tarn would also repay attention. You could not have a greater contrast between two tarns than between Angle Tarn above Patterdale and Angle Tarn under Bow Fell.

Dr. Mill has anticipated what I was going to say about the Measand delta on Haweswater. It is a very large delta for the size of the stream above it; larger than the Sandwick delta on Ullswater, which has three streams—Rampsgill Beck, Bannerdale Beck and Boardale Beck—bringing down a great deal of material. If you climb up above the beautiful falls to Fordingdale Bottom on the upper part of the Measand Beck, you find what looks like an old lake-floor, and cannot resist the conclusion that the Measand delta was formed, not gradually but at one fell swoop. It is very sad to think that it is all going to be swamped by the new reservoir. I hope, at all events, that the Manchester Corporation, when they raise the level, will not build a high wall all round Haweswater and hide the shores from view.

Mr. T. HAY: I would like to say that I am very much indebted to Dr. Mill, not only for what he has said but for his encouragement beforehand and for his kindness in lending me slides. I am also very much indebted to Dr. Marr and Mr. Lake of Cambridge, both of whom helped me very much.

I regret to say that I have not been able to examine Wastwater yet. I want to get there as soon as I possibly can. There is an interesting fact about Wastwater, that the Nether Beck delta does not conform to what I want it to do. But I want to see the delta before coming to any conclusion. Of course, when you remember that these deltas have been formed by overflow action from the middle line—and the action which I suggest can only take place on the margin—it would be a very extraordinary thing if they all did follow this windward trend theory, because once you have a diversion higher up it is utterly impossible for the margin action to alter that. Therefore it would be remarkable if one did not find exceptions to that rule.

With regard to the point Dr. Mill made about the bleaching action, I am extremely interested in that, and hope to be able to look into the point. You will remember that during last autumn a tarn burst its banks at Glenridding and did a great deal of damage. The striking thing about the results of that overflow is concerned with the question of bleaching. When you follow that stream right up from the lake to Keppelcove which burst its banks, the most noticeable feature right away up the valley is the bleached rocks on both sides of the stream. Those rocks had been covered for time immemorial with peaty materials, and when the overflow occurred the great volume of water and the boulders that it carried with it simply scoured both banks of that stream clear and exposed rocks which had not been uncovered for a great many years. They were all beautifully bleached by the acid action of the peat. The consequence is that you get quite a beautiful contrast between the pastel green of the tuff and the pink and white of the bleached portions.

The PRESIDENT: You will wish me to thank Mr. Hay in your name and in the name of the Society for his interesting and suggestive lecture. As regards the mechanism of delta formation in the lakes, which is perhaps the most original part of the paper, it occurs to me that a model might solve some of the problems. Remarkable things are sometimes done with models, and I throw that out as a suggestion. Mr. Hay, I think, has indicated, and we certainly all hope, that he will continue his investigations in the lakes, and we shall hope to hear him again in a year or two's time. We thank him very much.

THE ANTONINE ITINERARY OF THE AURELIAN ROAD BETWEEN AIX AND ARLES

R. D. OLDHAM

AMONG the itineraries of the Antonines is one of the " Via Aurelia, a Roma per Tusciam et Alpes maritimas Arelatum usque." So far as the tract between Italy and Aix-en-Provence (Aquæ Sextiæ) is concerned no great difficulty arises, some of the halting-places have not been exactly identified, though most of them have, and the general course of the road can be traced by the successive stages ; with this part I am not here concerned. From Aix on it is otherwise ; this portion of the itinerary has been generally misunderstood, and far-fetched and improbable hypotheses have been introduced to explain away the difficulties which can be more easily removed by adopting a different and, seemingly, more rational interpretation. It will be well to commence by repeating this part of the itinerary, which reads :

Aquis Sextiis	
Massilia	m.p.m. XVIII
Calcaria	m.p.m. XIIII
Fossis Marianis	m.p.m. XXXIIII
Arelate	m.p.m. XXXIII

Of the correctness of the text there can be no doubt ; the whole of the nineteen best manuscripts edited by Parthey and Pinder * are in agreement, except that one gives the distance in the last line as XIII miles, an obviously clerical error, and that Calcania, Calcana, and Calcari appear as variants of Calcaria. The distances are expressed as m.p.m., which in places and in some copies is expanded into " millia plus minus," an interpretation generally accepted by commentators. The distances, in other words, are confessedly approximate, and at best give only the nearest whole number of miles. The mile is the Roman one of 1000 military double paces, each measuring 5 Roman feet in length ; it is equivalent to about nine-tenths of a statute mile, and very closely so to $1\frac{1}{2}$ kilomètres, which may be taken as a convenient conversion factor, sufficiently accurate for the present purpose.

There is nothing to suggest that this part of the itinerary does not represent four successive stages between Aix and Arles, and as such it was accepted by the maker of the Peutinger chart, in which they appear strung out in succession, and the same interpretation has been accepted by modern commentators ; but when an attempt is made to adjust the itinerary to the map, or the country as it exists, numerous difficulties arise, all the more conspicuously since four out of the five places named are well known and their identification free from any doubt ; only one, Calcaria, remains unknown.

Applying this test we find that, on the interpretation above mentioned, the total distance from Aix to Arles amounts to 99 miles, whereas the direct distance is not more than 50 ; such an unnecessary detour, if such were the explanation, can hardly be accepted on the main road to so important a place as Arles.

* ' Itinerarium Antonini Augusti et Hierosolymitanum,' ed. G. Parthey et M. Pinder, p. 142. Berlin : 1848.

Then, taking the successive stages, we have first 18 miles to Marseilles, which is not far out, the actual distance by the modern road being 28 km., or about 18½ Roman miles. From Marseilles to Calcaria would be 14 miles, and 34 on to Fos, or a total of 48 miles, the actual distance direct through Martigues being not more than 33; to explain away this discrepancy the road has been taken round the north of the Étang de Berre, making the total distance about right. But there is no reason why this circuitous track should be taken; there is nothing in the way of a direct course being taken, for the obstacle presented by the outlet from the Étang de Berre would not have offered greater, more probably less, difficulty in Roman than in later times, and the other obstacle of the supposed existence of a long inlet from the sea to the Étang de Lavalduc is imaginary. The hollow in which this and the Étang de l'Engrenier lie, at an elevation considerably below sea-level and separated from it by a narrow barrier, has been very generally accepted by antiquaries as an old inlet from the sea, which existed as such in Roman times and has since been cut off by the formation of a barrier of coastal drift. The hypothesis is a tempting one when a map on not too large a scale is studied, but an examination of the ground itself, or an inspection of the geological map, shows that the barrier is composed of live rock, and must have been as firmly established in Roman times as it now is—more so, in fact, for the land then stood some 15 feet higher above sea-level.*

Finally, the itinerary seems to give 33 miles from Fos to Arles, but the actual distance is only 40 km., or 27 miles, and various détours have been suggested to account for the discrepancy. As I hope to show that the itinerary does not give the distance from Fos to Arles, but must be otherwise interpreted, the introduction of these circuitous routes becomes needless.

This interpretation being unacceptable another must be tried—that the road split up at Aix, and that the stages given were along different branches of the road. Trying this hypothesis, and taking the stage to Marseilles, we find the distance is correct, and, as there must certainly have been a main road leading to this place, we may take this as one of the roads dealt with.

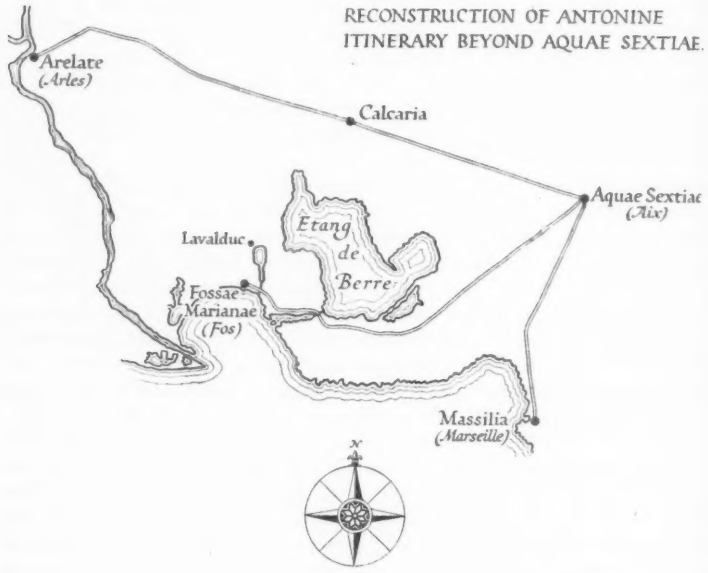
Leaving the unknown Calcaria on one side for the present, the next place to which there would probably be a main road is Fos, at that time an important seaport, and the distance from Aix by the direct route south of the Étang de Berre is about 50 km., or 33 miles, which agrees well enough with the 34 miles of the itinerary—a long stage but not long enough to be worth dividing into two. The only difficulty here is the intercalation of Calcaria, at 14 miles from Aix on this hypothesis; if it was an intermediate stage the total distance would become 48 miles; but even if the circuitous route round the north of the Étang de Barre was followed the distance from Aix to Fos would not amount to more than 40 miles—too large a discrepancy for this explanation to be acceptable.

The course of the main road to Arles is known by the old milestones which have been found. From Arles it bore northwards and then followed the foot of the Alpines, along the same general line as the modern road, as far as Mouriès, and thence across country in a pretty direct line to Aix. The total distance along this road is about 75 km., or 50 miles, while the

* *Nature*, 4 July 1925; *Science Progress*, Jan. 1926, p. 493.

itinerary makes it 47, if we regard Calcaria as an intermediate stage between Aix and Arles. The agreement is not so close as in the other two cases, but it is near enough to make the explanation reasonably possible.

It seems, then, that the itinerary between Aix and Arles does not represent successive stages along a single road, but stages and distances along three separate roads, leading to Marseilles, Fos, and Arles; the first two being reached in a single stage from Aix, the latter needing an intermediate stage, at Calcaria, 14 miles from Aix. The explanation raises only one difficulty, the placing of Calcaria, which ought by rights to follow, not precede, Fossis Marianis. For the rest, the agreement between the distances given in the itinerary and those required by the explanation is so complete, that the peculiarity of the position in which Calcaria appears may be attributed to a mistake made by the original compiler.



SUBDIVISION OF THE NORTHERN TERRITORY OF AUSTRALIA

A CHANGE was made last year in the political geography of Australia of which it is proper that there should be a record in this Journal. It affected the area known as the Northern Territory, of which the history had been briefly this: The first white settlement in the north of Australia was at Port Darwin on Melville Island in 1824, the creation of the settlement being due to a fear that this part was in danger of annexation by a foreign country. The settlement was long under the control of the New South Wales Government, as was indeed the whole of Australia east of longitude 129° E. until South Australia between 132° and 141° E. longitude and between the ocean to the south and 26° S. latitude to the north was cut out of it in 1838. The creation of Victoria and Queensland, in 1851 and 1859 respectively, separated New South Wales into two parts, of which the western one stretched right across the continent between longitudes 129° and 141° E., except for the area occupied by South Australia with the boundaries given above. In 1861 an extension of South Australia three degrees to the west and in 1863 one of Queensland also three degrees to the west left the detached part of New South Wales bounded by the ocean on the north, longitudes 129° and 138° E. on the west and east respectively, and latitude 26° S. on the south. In July 1863 " so much of the colony of New South Wales as lay to the northward of the 26th Parallel South Latitude and between the 129th degree and 138th degree of East Longitude " was annexed to South Australia and became known as the Northern Territory. The area of this territory was 523,620 square miles, equal to nearly one-fifth of the continent. In 1911 the Commonwealth Government, with the idea that the little control exercised over this great extent might become a menace to the defence of the Commonwealth and to the maintenance of the " white Australia " policy, took it over from South Australia, at the same time making provision for its government as a territory of the Commonwealth, and subsequently for its representation in the Commonwealth Parliament. In that year the population was only 3271, and although it had received a temporary increase due to special circumstances during the war, it was practically the same in 1922 : 3291, in spite of the very considerable expenditure from Commonwealth funds that had been incurred in its attempted development. The conclusion was then arrived at that this development had been hampered by lack of continuity in policy due to changes in the Commonwealth ministers responsible for it, and this in part to the want of such knowledge as could only be acquired if the responsibility were exercised within the area affected. The system of land tenure was also looked upon as a serious handicap to the development of the territory, and it was recognized that the policy of gradually subdividing the holdings in the smaller areas could only be carried out with a great improvement in transport facilities, and that such an improvement was also necessary to take advantage of the mineral-bearing character of certain districts. Two changes were then decided on, namely to subdivide the territory into two parts to be administered from suitable centres within them, and to constitute a Commission with

considerable powers to advise and to carry out, under the general control of the Commonwealth Parliament and Government, a general scheme of development dealing with railways, roads, telegraph and telephone lines, water borings and conservation, ports and harbours, and certain other matters within the limits of the northern part of the territory. Accordingly the " Northern Australia Act " to make further provision for the development and government of the Northern Territory of Australia was passed by the Commonwealth Parliament and assented to on 4 June 1926. It defined

" North Australia " to mean that part of the territory situated north of the 20th Parallel of South Latitude; and " Central Australia " as that part situated south of this parallel. A part of the Act established for North Australia a North Australia Commission of three members, appointed by the Governor-General, for the purposes already indicated. It was provided that by agreement with either the Government of Western Australia or the Government of Queensland the powers of the Commission might, with some modification of its constitution, be extended to parts of those States contiguous to this Territory. As regards administration, on the division into North and Central Australia as defined above taking place, these areas were to be

severally administered as territories under the authority of the Commonwealth, Government Residents being appointed for each of the territories. They were to be assisted in each case by an Advisory Council consisting of four members, two of whom were to be nominated by the Commonwealth Government and the other two to be elected, the election taking place under the Commonwealth franchise and within the area concerned. The appointment of such a Council was looked upon as a step towards the self-government of the areas created, the preamble of the Act itself stating that its provisions were " in anticipation of, and with a view to making provision for, the establishment of a measure of self-government in the Northern Territory." The area of North Australia thus created is 287,220 square miles, and that of Central Australia 236,400 square miles. The seat of government of North Australia was to be established as soon as practicable at Newcastle Waters, and until so established was to be at Darwin, the former headquarters of the Northern Territory. The seat of government of Central Australia is at Alice Springs. It was contemplated that, with railway communications to the Macdonnell Ranges, Alice Springs would be brought much more closely into touch with the seat of the Commonwealth Government at Canberra than is Darwin, through which all communications with regard to the country now to be administered from Alice Springs formerly passed. These important administrative changes came into effect by proclamation on March 1st of last year.

ANTARCTIC CRITICISM: A REVIEW

ANTARCTICA. A Treatise on the Southern Continent. By J. GORDON HAYES. *London : The Richards Press Ltd.* [1928.] 10×7 *inches ;* xvi+448 *pages ; illustrations and maps.* 42*s*

THIS substantial volume is the work of an enthusiastic student of polar exploration who has devoted years of labour to its preparation and has earned the gratitude of his readers by appending a full and accurate index extending to no less than forty-two pages in double column. Indexing is so often neglected or abridged in geographical works that a good example such as this deserves a grateful word.

The object of the book is to give a general description of the Antarctic regions, a critical record of recent exploring expeditions, and a series of suggestions as to future exploration. The programme is ambitious, and any one who dares to attempt it without personal experience of the polar regions or first-hand knowledge of equipping and organizing an expedition must possess courage comparable with that of the explorers whose life's work he weighs in the balance of his judgment. Our author has the courage ; his trumpet gives no uncertain sound in the proclamation of his meed of praise or blame, and he need not be surprised if polar experts meet him with equally frank criticism.

The book is divided into three parts entitled respectively Natural Features (five chapters), Recent Exploration (nine chapters), and the Future (five chapters), succeeded by an Addendum, a Glaciological Glossary, and eight Appendices. There are numerous diagrams and maps (four of them in a pocket at the end) and a small but choice collection of photographic views. Everywhere we find the comparison of one expedition with another, or of one

explorer with another, and the expression of confident conclusions drawn from the records of the expeditions. Many of these conclusions will meet with the approval of most experts, but some will be warmly disputed by explorers and their friends. In this review we feel justified in dealing only with those general aspects in which one student without personal experience of the Antarctic may comment on the work of another similarly limited.

The most serious fault we have to find is the narrow basis on which the whole work stands. It is obvious at an early stage that only English sources have been utilized. Little is said of the voyages of the *Gauss*, the *Deutschland*, or the *Français*, of which no English translations have appeared, and nothing of the magnificent Reports of the *Gauss* expedition, which are equalled in scientific importance only by those of the *Terra Nova* and of the Australian expeditions.

The object of Part I appears to be to inform the general reader as to the general conditions of Antarctica, and on the whole this is done adequately. Had the aim been to summarize scientific knowledge on the subject the bearings of the results so far obtained on geological and meteorological theories would no doubt have been touched on. Even for a popular statement on meteorology, however, the work of Meinardus on the results of the *Gauss* and of Barkow on those of the *Deutschland* should have been set beside the fine memoir of Simpson on the *Terra Nova* work, while if Mohn's discussion of Amundsen's meteorological data had been known to the author some of the rather harsh animadversions on that explorer's neglect of scientific observations might have been modified. Mr. Hayes is wrong in supposing (p. 259) that no professional meteorologist was included on the staff of any Antarctic expedition before Scott's last voyage ; Mr. R. C. Mossman on the *Scotia* in 1902 was an accomplished meteorologist, and Dr. Bidlingmaier on the *Gauss* in 1901 was highly trained in both physics and meteorology. The Table of the dimensions of exceptionally large icebergs on p. 58 could have been greatly extended by reference to the existing literature on the subject ; the twenty-eight instances quoted are by no means the most remarkable which could have been given. There is a bright side to the imperfect harvesting of relevant data, though it lies in the future when a really comprehensive effort may be made to classify the statistics the value of which for comparative purposes Mr. Hayes has recognized without being able to grasp them.

Part II is devoted to recent exploration, the method being that of a commentator rather than a chronicler ; on this account some readers may find it difficult to follow the progress of the various expeditions. A full report of all the doings of the explorers of the last thirty years would, however, have overflowed even this ample volume. Moreover, the aim of Mr. Hayes being to compare and criticize the methods and results of South Polar travel, he was wise in sacrificing the ideal of an impartial narrative on the very small scale which alone would have been possible in the space available.

The value of the book rests mainly on the critical remarks regarding each of the main British expeditions and the Norwegian attainment of the Pole. The aloofness of the author from the leaders of these expeditions and from the controversial atmosphere in which most of them were kindled into being enables him to assume a position of detachment unattainable by one who shared the hopes and fears, the successes and failures, of those exciting years. Probably it is this fact which makes it appear that Mr. Hayes sees Scott, Shackleton, Mawson, and Amundsen ranged alongside Cook, Bellingshausen, Biscoe, and Ross on the horizon of history. His views thus acquire an interest as forecasting the possible verdict of posterity even when we cannot fully accept them as our own.

The discussion of the American expedition under Wilkes is the only important criticism of earlier expeditions, and even the amazing courage of Wilkes in navigating those terrible seas in such poor craft as he commanded does not deter Mr. Hayes from a stern denunciation of claims which have been proved erroneous. With regard to modern expeditions criticism should serve a useful purpose by putting new explorers on their guard against old errors. We agree with Mr. Hayes in his consistent depreciation of man-hauled sledges as the principal means of transport over ice, and there is much force in his contention that the ultimate cause of the tragedy of Scott's last journey was the exhaustion produced by months of unceasing physical toil on an inadequate diet. Mr. Hayes speaks strongly on what he feels to be the bad organization of Scott's last expedition, attributing it to the dominance of the old naval tradition of polar exploration as upheld by Sir Clements Markham. He does not recognize what might strike some people as a revolt against tradition in Scott's use of several different modes of transport, such as motors, ponies, and dogs ; the ultimate resort to man-haulage condemns the whole plan in his eyes. He points out how an abundant supply of dogs and of food enabled Amundsen's party to reach the Pole with comparative ease and to return with safety over a more difficult route than that followed by Scott, and he gives, facing p. 268, an effective diagram comparing the two routes. There will undoubtedly be controversy regarding many of the points raised, especially as to the contention that the weather on Scott's last journey was not so very much worse than that encountered by Amundsen and Shackleton.

It must not be supposed that Mr. Hayes's criticism expends itself in fault-finding. He has also discriminating praise to bestow : for example, on Shackleton's fine survey work on his Southern journey ; on almost every detail of Mawson's great Australian expedition ; and on the scientific achievements of the *Terra Nova* specialists. The subordinate members of the various expeditions have their share of judicious praise ; but we think more credit should have been given to Armitage for his pioneer ascent of the Antarctic plateau in 1902, which was a fine achievement and prepared the way for Scott's longer journey in the following year. The drift of the *Endurance* in the Weddell Sea acquired much of its value from comparison with the parallel drift of the *Deutschland*, and the track of the latter ship should have been entered on sketch-map No. 6. The notes on the *Endurance* include interesting extracts from the unpublished private diary of Mr. James, the physicist of the expedition.

Much labour has evidently been bestowed on drawing up comparative tables of the different expeditions, which have a certain value, though we cannot feel satisfied that the distance travelled or the rate of movement enables one to argue that with a different method of transport a particular party could have achieved success proportionate to that of another party who had done exceptionally well in a different set of conditions. Nor can we accept the popular narratives, from which for the most part Mr. Hayes obtained his data, as good enough for setting up a comparison such as that of the time different expeditions required to traverse the pack ice of the Ross Sea. In the tables on p. 321 only fourteen southward crossings of the ice-pack could be dealt with, while, speaking from memory, at least forty-two crossings (both southward and northward) of the pack have been made, all but four of them since 1895. To be effective such a comparison would involve the scrutiny of the original ship's logs—a heavy task, though necessary.

Part III gives suggestions as to future work which show that Mr. Hayes has mastered many of the lessons set by past experience. He rightly stresses the importance of a preliminary survey of the portions of the coast of Antarctica

which have not yet been discovered, and distinguishes between rapid journeys inland from new points and the establishment of new bases for more prolonged series of observations. He advises the use of dog-traction and ski for all journeys on the ice, and gives a prudent caution as to the absolute necessity of employing good dogs and efficient drivers. Yet he does not fail to foresee a possible future for mechanical transport of the light-tank type and of air-craft. It would have been interesting had he argued out the question as to whether the quickest way to open up Antarctica might not be by devoting time at home to the elaboration of a mechanized force and delaying work in the actual field until machines had been made to work effectively on the ice of the nearer Arctic.

An interesting chapter is devoted to legal considerations as to the boundaries of the two British Antarctic dependencies and the title to the lands claimed.

Enough has been said to show that this book has defects and excellences; the former largely due to the unqualified expression of opinions, the latter to an instinctive gift for criticism controlled and fortified by the assistance rendered to the author by such well-known Antarctic authorities as Messrs. Priestley, Debenham, James, and Wordie. HUGH ROBERT MILL.

A STUDY OF DESERT PROCESSES

DER FORMENSCHATZ DER NORDCHILENISCHEN WÜSTE: Ein Beitrag zum Gesetz der Wüstenbildung, von HANS MORTENSEN. *Berlin: Weidmannsche Buchhandlung* 1927. 10×6 *inches;* viii+192+ix *pages; illustrations and maps. M.*18

THIS is a very important contribution to knowledge of desert processes, primarily because hitherto much vagueness has prevailed regarding the recognition of intensity of desert conditions. Dr. Mortensen seems to have discovered the essential features of the most absolute desert type, and he has supplied a very reasonable explanation for them. The cause of delay in this important discovery appears to lie in the fact that previous investigators worked in less extreme deserts; for it seems likely that no part of the Earth can match in this respect the Interior Valley of Chile between latitudes 21° 30′ and 23°, and this region has now been studied in detail for the first time. The author therefore finds it necessary to point out that the application of the name Atacama Desert to the above district is misleading, for the Chilean province of Atacama to the south is much less desertic in character.

Mortensen here upsets the belief generally held that in the most arid regions of the world, at least the smaller land forms are the result mainly of mechanical weathering, " creep " under gravity, deflation, æolian erosion and deposit, together with occasional sheet flood and stream action. For he demonstrates that, paradoxically, the forms of this, apparently the Earth's most arid region, have been caused almost solely by running water, whereas on the margins of the area the other processes above mentioned attain greater importance. The main reason for this the author sees in the existence in the extreme desert of an almost uniform cover—on mountain and plain alike—of a thin hard-baked *dust skin* (here and there replaced by a coating of small stones) which resists all wind action for the reason that the wind is not armed with abrasives, sand being virtually absent except on the margins where the desert is less extreme.

Dr. Mortensen has drawn a very careful portrait of this Chilean waste. His observations, of which this is a precise and detailed account, were made between June and September 1925, for the most part between latitudes 21°

and 23° in the region threaded by the Río Loa, but also in the district north-east of Taltal (lat. 25°) and again about Arica and Tacna (lat. 18°). He gives a number of excellent photographs and diagrams, which fully illustrate his account, and there are three large-scale maps of the Toco district near the lower Loa, by Mr. Edinger, a local surveyor. He had access to unpublished climatic material worked up by Dr. W. Knoche, formerly Director of the Chilean Meteorological Service; and he summarizes the essentials of these data, reproducing maps by Knoche of the cloudiness and of the "rainfall deficiency" of Northern Chile and one of the rainfall by Edwards and Knoche.

The North Chilean desert is described under three heads: The desert heart (*Kernwüste*), the intermediate desert (*Mittelwüste*) north and south of this and also nearer the coast, and the marginal desert (*Randwüste*) south of about 26°, north of Copiapo. Within each of these zones, all of which lie west of the Andes slope proper, the major land forms are grouped under: Mountain and hill chains, pampas—which may here be loosely translated "plains"—and isolated hills.

A brief summary of the chief features of the extreme desert may be given here. The hill chains have rounded summits, attributed to the action of occasional sheet floods from rain. The hills are dissected by an exceedingly close-meshed continuous drainage system giving a "bad-land" character to them. The slopes are scored by innumerable small gullies, parallel and seldom uniting on steep slopes, more articulated on gentler slopes. Cliffs are almost absent, and varied geological structure causes little modification on the surface, the rock being uniformly masked, in places by stones averaging fist size, but generally by a yellowish-grey dust layer some 4 inches thick; and the stones when present lie on or in this material. Thus there is little variation in colour of the landscape. Vegetation does not exist. Many of the stones have the desert patina, probably here due to chemical alteration. Under the dust layer is a thicker bed of whitish salt dust (partly sodium sulphate). The superficial dust forms a hard skin a few millimetres in thickness. This *dust skin* is the most important single characteristic of *extreme* desert, for it resists wind action and appears to retard if not to prevent the downward creep of débris under gravity. Evidences of creep, even on steep slopes, are not common. On the other hand, dried mud streams are everywhere to be seen—and intact. The origin of the dust the author cannot explain fully, but he believes it to be formed *in situ*. The skin is forming at the present time, for old footmarks were thus encrusted, while new ones bared the loose white salt dust. Weathering is very slight, and the supply of detritus is evidently much exceeded by the power of the episodic streams to carry it away. Owing to the scarcity of detritus the intermittent vertical erosion in gullies keeps their slopes convex, and bigger channels are overdeepened.

The Pampas are plains composed of immense alluvial fans in part probably deposited by streams of the Ice Age coming from the Andes (it should be noted that even then this area of deposit may have been a desert). The fans are dissected in many parts by sharply cut dry river-beds. But these and the whole surface have the dust skin. Old wheel tracks, which had broken the skin and laid the loose dust open for the wind to carry it (if it would), remained quite fresh, though they were known to have been made certainly not less than ten years before; likewise the many miles of shallow trench, cut to mark limits of nitrate properties. The pampas also exhibit continuous drainage systems, which of course change their position easily; but plain duly leads down to plain, and the only enclosed basin seen was due to a blockage by detritus from a hill valley.

The author concludes that these forms are due almost entirely to running water operating with tremendous vigour after catastrophic deluges at long intervals—at least ten years and probably much longer on the average. Between these episodes the landscape is in effect like the frozen surface of the Moon.

Little can be said here of the " Intermediate Desert," studied specially near Taltal and near Iquique. As in the desert heart, the main agent is the rare downpour of rain-water. But here during the intervening periods the surface is not dead. There is much more detritus, including sand, and the effects of wind are somewhat more obvious. The dust skin is less uniformly developed, and in consequence the pronounced difference from the extreme desert is the greater effect of downward creep under gravity, the valleys being blocked and more bare rock being visible on steep slopes. Also the valleys are concave and the hill crests are sharper.

The marginal desert (Atacama) was not examined in detail, but the author records that to a traveller coming north in the train the first sign of very arid conditions is the little tongues of sand heaped behind every bush. These sand tongues then increase in size, and one expects soon to enter a real dune area. But instead the tongues decrease, and then cease somewhat north of Copiapó, although the bushes extend beyond this. The explanation of this phenomenon lies in the above statement of relative desert criteria.

A long chapter is devoted to the climatic causes of the desert zoning recognized. The data set forth seem to justify the author in rejecting successively the following as the chief factors in determining the situation of the most extreme desert :

(*a*) Temperature, for this increases gradually from south to north.

(*b*) Rainfall, for the average annual precipitation throughout the whole desert from lat. 26° is less than 10 mm. However, it seems likely that rain is less frequent in the desert heart than elsewhere, and this is important.

(*c*) Wind velocity ; while the observations of this are all from the coast, the evidence for rejection seems satisfactory.

(*d*) Atmospheric humidity, dew, and fog ; dew is infrequent, much more so than in the Namib Desert of South-West Africa. Fogs (*camanchacas*) are frequent on the coast in winter, but they rarely cross the coast-range and reach the extreme desert.

(*e*) Cloudiness ; Knoche's map of this bears out the author's contention.

Having virtually eliminated all these, save possibly rain frequency, the author turns to evaporation and shows by allusion to Knoche's tentative map of rainfall deficiency that the desert heart seems to lie in the area of greatest evaporation, where the rainfall deficiency is —4000 mm., and which forms a zone extending south-south-east from about the Loa bend. He considers that the dust skin is most effectively formed where the soil moisture—from occasional rain or from the hygroscopic character of the saline soil—is most rapidly evaporated.

The book closes with a comparison of this with other deserts, and here, as throughout the work, it is clear that the author was fully informed as to the results of all previous desert researches. It should perhaps be mentioned in conclusion that he pays particular attention to the striking arguments contained in W. Penck's posthumous work, ' Die Morphologische Analyse,' to some of which he takes exception, notably to the generalization regarding the tectonic causes of all valley forms, to the explanation of inselbergs, and more especially to those relating to arid forms which Penck saw in a less extreme desert.

A. G. O.

REVIEWS

THE CELTIC BORDERLAND. By F. J. SNELL. *London : Robert Scott* 1928. 8×5 *inches ;* 416 *pages ;* 20 *full-page drawings by* Fred Adcock *and numerous sketches.* 7*s* 6*d*

This conveniently arranged and lucidly written book should prove most useful to any one making a tour through the country of the Marches. After an adequate historical introduction Mr. Snell takes his readers from Gloucester to Chepstow, thence up the Wye valley, and then by Welshpool and the Dee country to Chester, returning south to Tewkesbury by way of Shrewsbury and the Severn. He is a pleasant guide, never didactic and always ready with a legend or a scrap of historical lore to beguile the way. But he is occasionally careless. On p. 48 he gives the date of the foundation of Tintern Abbey by Walter de Clare as 1139, and on p. 84 as 1131. Repetition is always tedious, but inaccurate repetition is both inexcusable and confusing to the reader who is not aware that the latter date is the correct one. Mr. Fred Adcock's drawings and sketches add charm to the book, which is also provided with a sketch-map and a topographical index. If a second edition of the book is called for, Mr. Snell, who quotes freely from other writers such as A. G. Bradley, might well add a bibliography. O. R.

MARCHING SPAIN. By V. S. PRITCHETT. *London : Ernest Benn Ltd.* 1928. 9×6 *inches ;* xiv+224 *pages ; illustrations and sketch-map.* 10*s* 6*d*

SPAIN FROM THE SOUTH. By J. B. TREND. *London : Methuen & Co. Ltd.* 1928. 9×6 *inches ;* xii+256 *pages ; illustrations and sketch-maps.* 10*s* 6*d*

Mr. Pritchett and Mr. Trend are very different people travelling through very different Spains. Mr. Pritchett, afoot and in a hurry, follows from Badajoz to Leon the route of the old Roman road across the dip in the Central Sierras ; he crosses the least happy of the Spains. Mr. Trend, a leisurely traveller, finds his way by coach and train from Algeciras through Andalusia to Toledo, across the happiest Spain, or at least the gayest.

Mr. Pritchett's is a book of reactions—fortunately we have the scale of his reactions in the introductory chapter before he has left Waterloo Station ; everywhere he seems to be tearing fiercely at his environment as if to extract from it the last ounce of emotional quality. His towns are excellent, sketched with the few, sure strokes of the master. His landscapes are apt to be forced : " the pallid tableland . . . lay mapped below us crying with the blenched light shrill as a frightened bird," for example. Of his people we can only say that we find in them a very great deal of the vulgarity and fret of life, of " the crude, oily body " in which " the spirit, an exquisite, yearning, knife-like thing," is enclosed ; neither body nor spirit attracts Mr. Pritchett's sympathy very much in Spain, or perhaps anywhere else. We gather that he thinks that the essential Spaniard touches essential reality most closely in the bull-fight, which is as true as the corresponding statement for the Anglo-Saxon would be, reading " prize " for " bull." ' Marching Spain ' is a restless book, but emphatically a book to read ; less apt than most clever, subjective books to lapse into mere verbal dexterity, it is marred by some tiresome mannerisms : the abuse of " myriad " is one of them.

Mr. Trend is objective, and is at his best in careful objective description—of the dance of the *seises*, for example, in Seville Cathedral. For the rest his travels are mainly the occasion on which he gives his readers lessons in the

history of Spain, or on which he reviews informatively a book on some aspect of Spanish art or literature. Some of his excursions into the byways of literature, Muslim and Castilian, are delightful; so are the travel episodes and casual conversations. But the book seems incoherent, and the general idea of "working northwards, following as far as possible the course of Spanish history," does not seem to have sufficient vitality to give it unity. Mr. Trend is least fortunate when he touches on matters more suited to be the subject of exact inquiry; the philological argument found on pp. 96 *et seq.* is destroyed by himself in a footnote, and both the argument and the counter-argument are obviously unsound; the pages of the *Revista de Occidente* are clearly not the place to test an influence which was, on Mr. Trend's own showing, largely confined to the language of rural life, and, even in this sphere, the Arabic influence is neither so great nor so widespread as the argument suggests. There are a number of mistakes on points of detail throughout the book, the most obvious and most amusing being two references to "Professor H. S. Merriman."

These two interesting books should both be read, if only to be convinced of the fallacy lurking behind the use of the word "Spain" as if it were a singular noun, instead of a convenient collective expression designating the body politic whose monarch is *Hispaniarum Rex*. R. A.

DER ABBRUCH DER INSEL SYLT DURCH DIE NORDSEE. Von FRIEDRICH MAGER. Schriften der Baltischen Kommission zu Kiel, Band VI. *Breslau: Ferdinand Hirt* 1927. 10×7 *inches; 199 pages; 5 maps in pocket*

This is a very detailed work on one of the North Frisian Islands—Sylt. The author has studied the island itself, and the literature bearing on it, most thoroughly, and has compiled a monograph of great value to those having a sound knowledge of the locality. The detail, however, makes the book rather heavy reading to those—and they are the vast majority—who do not know Sylt.

The treatment is mainly physiographical and historical, and elaborate measurements are given to show the changes which have taken place in the island. These changes are summarized in a later chapter. The final chapters deal with the history of the Sylt coasts in pre-Prussian and Prussian times.

The extreme care which the author has taken renders the work valuable as a mine of information on this particular island, and, what is more, affords the inquirer into coastal studies a source-book of some of the types of material suitable for such a study. This is particularly the case with the historical material—which is handled with discretion. Sylt, in this respect, is a comparatively fortunate island.

We should like to see a short paper summarizing the author's main conclusions, and relating Sylt to the Frisian Islands as a whole. J. A. S.

UNKNOWN ITALY: PIEDMONT AND THE PIEDMONTESE. By E. A. REYNOLDS-BALL. *London: A. & C. Black Ltd.* 1927. 9×6 *inches;* xii+254 *pages; illustrations and a map.* 10*s* 6*d*

A DAWDLE IN LOMBARDY AND VENICE. By INGLIS SHELDON-WILLIAMS. *London: A. & C. Black Ltd.* 1928. 9×6 *inches;* viii+270 *pages; illustrations and a map.* 10*s* 6*d*

It is a pleasure to fish up a book like this by the late Mr. Reynolds-Ball from the stream of volumes on Italy written by tourists of no particular powers of observation, recording impressions as often as not of their first visit to the

country. The author has lived long in Piedmont and knows the inhabitants and their customs and beliefs as few Englishmen can do. He does not set out to take the conventional round that those who read much of this type of literature get to know so well. The first chapters deal with subjects such as the manners and superstitions, the language, ballads and proverbs, the vintage or the menta industry or the silkworm. Some of the customs he describes are not confined to Piedmont, it is true, but are common to the whole peninsula. When he starts sight-seeing he follows his own route. He discusses the Alpine passes, or the Waldensian valleys with their Protestant communities, or the Val d'Aosta, or life on a Piedmontese farm. He also has a good deal to tell us about the dialect, which is by no means one of the easiest in Italy. It is a pity he has limited his literary landmarks to the Riviera and to Englishmen, and we could have done with rather more historical allusions. It seems strange to read a book on Piedmont in which the name of Alfieri, for instance, does not appear.

Mr. Sheldon-Williams's dawdle is much more on the usual lines, though he went with a bicycle and was careful to stop at and tell us about the lesser places, always full of interest in Italy, especially in the North, which rivals the Low Countries as a battle-ground of Europe. He does not profess to have any special knowledge of the country or its inhabitants beyond what he picked up as he went along. We gather that he is English, but from his type of humour, his air of real or assumed innocence, and even his style, he might well have hailed from across the Atlantic. Amusing he certainly is, and he has an artist's eye, but his adventures, which are of the usual tourist kind with inns and people on the road, are rather spun out, and it is these that take up most of the book, though he can on occasion make shrewd comments on accepted judgments which set one thinking. We like his sketches.

L. C.-M.

ADVENTURES IN ARABIA. By W. B. Seabrook. *London : Harrap & Co.* 1928. 9×6 *inches ;* 314 *pages, and illustrations.* 12*s* 6*d*

This is not a record of important travel or exploration. The author is an enterprising American journalist seeking a fresh store of interesting material for his fluent pen. From early youth his imagination seems to have been fired by what he had read and heard of the glamour and fascination of the Middle East, and at length fortune smiled on him in the person of a young Druse travelling in the United States whose ready cooperation made possible the realization of the author's ardent wish to see things for himself—and see them to an extent which he could never have anticipated. He made the fullest use of his opportunities and gives us the result in the present volume, which is composed of four separate sketches, relating to as many independent excursions, namely :

(*a*) A sojourn of some weeks with the Beni Sakhr badawin, camped on the borders of Transjordania, a night's ride from the capital, Amman.
(*b*) A visit to the Druses of the Hauran, as guest of the Atrash family.
(*c*) A pilgrimage to the headquarters of the Whirling and the Howling Dervishes, in Northern Syria.
(*d*) A run across to Baghdad and Mosul by car, and an excursion from the latter town to visit the Yezidi community and their shrine at Shaikh Adi.

It was only on the first of these pilgrimages that the author touched the fringe of " Arabia " properly so called, so that the title given to the book involves some writer's licence ; but though he breaks no new ground geographically, his keen spirit of enterprise and the sympathetic interest which

he displayed in the life-history of the various communities visited, were richly rewarded, and his graphic account of the experiences which came to him and the episodes of which he heard tell, makes excellent reading.

It is perhaps not surprising to find him occasionally off the rails in regard to matters of historical fact, and as the book is admittedly not of the type to which one would look for history, the point is not of much moment; but what surely is greatly to be deplored is the author's light-hearted readiness to play the rôle of Simon Peter, and to belittle the faith of his fathers as gratuitously as he does (pp. 46 and 213). Oh, Shade of Charles Doughty!

When the reviewer reads these passages he cannot help recalling the case of an Oriental who was once a candidate for a clerical post in his employ. To a letter enumerating his qualifications and enclosing his credentials, this gentleman naïvely added the following: "P.S.—I am ready to convert at any time."

But did our author really become a Muslim, as seems to be assumed? Surely he must have misunderstood Shaikh Medtkal, when he quotes the latter as saying that "there is nothing more required to live as a true Muslim and enter Paradise than the repetition of La Illaha illullah: Mohammed Rassoul Ullah." Time was when a touch of the surgeon's knife was also essential for the fashioning of the complete Muslim, but to that rite our author does not seem to have submitted hinself, so after all he may not be irrevocably lost to the Christian fold. P. Z. C.

THROUGH THE HEART OF AFGHANISTAN. By EMIL TRINKLER. Edited and translated by B. K. FEATHERSTONE. *London: Faber & Gwyer* 1928. 9×6 *inches;* 246 *pages;* 44 *illustrations;* 1 *folding route-map.* 15*s*

AFGHANISTAN; EINE LANDESKUNDLICHE STUDIE. By EMIL TRINKLER. (Ergänzungsheft Nr 196 zu *Petermanns Mitteilungen*) *Gotha: Justus Perthes* 1928. 11×7 *inches;* 80 *pages;* 3 *text-figures*, 4 *illustrations and* 4 *maps*

Dr. Emil Trinkler is a German geologist who in 1923–24 made a journey across Afghanistan from Turkestan to the Khyber Pass on behalf of a newly founded Afghan trading company. His geological investigations enabled him to see more of the country than would fall to the lot of an ordinary traveller. Moreover he was prepared for his task by an interest in the countries of Asia dating from his school days—an interest sufficiently intense to lead him to equip himself with a knowledge of Persian. In 'Through the Heart of Afghanistan' he has given a delightful pen picture of his travels. The book has gained, rather than lost, by Mr. Featherstone's sympathetic translation; the English edition is more attractively produced than the original German, and has a map showing the author's route. Entering the country—after lengthy delays resulting from a lost passport—at Chehil Duktaran, he travelled by Herat, up the Hari Rud valley, across the Akserat and Unai Passes to Kabul. The winter of 1923–24 was spent in the Afghan capital; in January 1924 a geological expedition to investigate the coal and iron deposits in the Hindu Kush north of Kabul was undertaken at the request of the Amir. Kabul was left on March 18 *en route* for Peshawar, but a return was made in June, the capital being finally left in October. The author has given us more than a pleasant account of his sojourn in a country which was, until very recently, closed to Europeans. The summer of 1924 was marked by a serious rebellion, in the instigation of which there is no doubt Russia took a serious part. "Afghanistan is for Russia the stepping-stone to India. The inhabitants were discontented with the many changes brought about by the King; taxes

were heavy ; the people were grumbling, and the time was ripe for Russia to organize a revolution." Dr. Trinkler believes that " the Hindu Kush will again play a leading rôle in the decisive battle between the Russians and the British for the overlordship of Asia," but at the same time does not hide his admiration for British administration and statesmanship—" for where the Union Jack flies there is peace and good order. One is astounded when one sees what England has done for India."

The scientific results of the expedition, the publication of which was promised in the first book, have been summarized in ' Afghanistan ; eine Landeskundliche Studie.' This is an excellent, systematically arranged account of the geography of the country, with a valuable bibliography. It is interesting to note that the bulk of the literature dealing with Afghanistan is in English and is largely the work of officers connected with the Indian Government or Indian Army. Dr. Trinkler has evidently not seen the recently published work of M. Raymond Furon (' L'Afghanistan,' Paris, 1926), and it is interesting to compare the two works. Dr. Trinkler has collected systematically what is known of the country ; M. Furon has attempted a synthetic geographical description after the manner of the regional surveys of the French school. The French work is the more interesting and conveys a more vivid picture of the country to the mind of the reader. M. Furon has travelled more widely in the south on the Kandahar roads, and brings his personal experience to bear on the question of present-day communications in Afghanistan. Dr. Trinkler, on the other hand, gives an interesting summary of what is known of the routes followed by Alexander the Great, the Chinese Buddhists of the fifth to seventh centuries, the Arab geographers, the Mongol Jinghis-Khan, Babur, Marco Polo, and Benedict Goes. The French and German works are thus largely complementary, and both authors are to be congratulated on their contributions to the serious geography of the buffer state of Asia. L. D. S.

A TOUR IN SOUTHERN ASIA, 1925–1926. By HORACE BLEACKLEY. *London : John Lane Ltd.* 1928. 9×6 *inches ;* viii+298 *pages ; illustrations and sketch-map.* 12*s* 6*d*

This is a well-written travel book, which, going over familiar ground, furnishes, as such books should, a " live " report of places and peoples as they are now. The descriptions are good ; the author has an observant and humorous eye, a shrewd and caustic tongue. Perhaps his views are none the less enlivening because he occasionally lets his prejudices run away with him and land him in some inconsistencies.

There is a good deal of information on the problem of the half-caste. The Briton, though he will not agree, will do well to study the attitude of French and Dutch towards this most difficult question. Without giving any decisive judgment, the author at least implies that the common view of the half-caste inheriting " the vices of both races and none of the virtues " is a shallow one. Of course it depends entirely on the actual parents, usually drawn from a low class on both sides, whilst " chance " children are naturally sadly neglected. Given a reasonably decent parentage and fair opportunity the half-caste makes good. But whether his production is to be encouraged is another matter.

The most interesting part of the book deals with Cochin China—ancient and modern. A large section is devoted to Malaya and its constitutional questions. Unfortunately, on his own confession, the author did not come into any real contact with the Malays, and his remarks on the ubiquitous Chinaman do not show much understanding. There is a vivid account of the little-known Singapore mutiny of 1915, showing that the wild rumours of the China coast at the time were not so very exaggerated.

The chapters on Java are all too brief, but what there is is good. We have an interesting comparison of its geographical and strategic importance with that of the neighbouring Sumatra, of which we also get a glimpse. The final chapters on Ceylon do not contain much of value. The author appears not to appreciate Anuradhapura, and has no impressions of it worth recording. Finally, if he really wishes to excite the interest of the untravelled, as he is well capable of doing, he should provide proper maps and plans. A. S. E.-S.

CHINESE GHOULS AND GOBLINS. By G. WILLOUGHBY MEADE. *London: Constable & Co. Ltd.* 1928. 9×6 *inches;* xvi+432 *pages; illustrations.* 24*s*

A veritable mine of information about Chinese folk-lore, most valuable for all—and one hopes there are many—who try to understand the Chinese. The author warns us against "generalizations," but the reader will conclude that at least three may safely be made (or confirmed) about them. They are a superstitious folk; completely illogical in their beliefs; and, arising out of these, much like other human beings at bottom, as the author indeed most justly affirms.

The puzzle is, however, Why should a people, of such highly developed civilization, whose cultured classes have not been entirely isolated from the common herd, have retained gross superstitions long discarded by advanced Westerners? Why, too, did not the alchemy of the Taoists lead to real natural science? There is no answer here to these questions, but plenty of food for speculation thereon. Geographers will note with interest how the "Feng Shui" superstitions have stood in the way of proper survey work, and road and railway development.

The brief account of Buddhism would have been made clearer for the general reader if the author had explained the moral purpose behind the Buddha's teaching—that of inculcating "virtue for its own sake." Again, it would have been well to explain that the Supreme Ruler of the Taoists is not the Creator, but the creation of the impersonal Tao.

There are some just comments on the alleged practice of infanticide. Altogether a difficult subject treated with sympathetic understanding.

A. S. E.-S.

AN OUTLINE HISTORY OF JAPAN. By HERBERT H. GOWAN. *London: D. Appleton & Co.* 1927. 9×6 *inches;* xvi+458 *pages; map.* 15*s*

Professor Herbert Gowan, of the University of Washington, has rendered good service at the present time, when all eyes are turned towards the Far East, in publishing a compact but eminently readable history of Japan and the Japanese people. Though called an outline, his book is no mere summary of names and dates, but tells its story in easy flowing language from the earliest mythical and legendary times to the most recent events. The author is evidently a sincere admirer of this remarkable people. He speaks with natural pride of the part played by his country in opening up relations with them through Commodore Perry in 1853, and indeed for many years before that date, during which time frequent attempts were made, it seems, by Americans and others to break through the anti-foreign barrier. Since then America, he claims, has played a great part in encouraging the marvellous growth of the Island people. He is opposed, however, to the present American policy of exclusion as directed against the Japanese, and thinks it would be amply worth while for his country to adopt an attitude towards them more consistent with a broad theory of racial equality. In an interesting chapter on the aftermath of the Great War he leads up to the Washington Conference of 1921–22.

Japanese hesitation to take part in its deliberations were overcome, it appears, by the assurance felt by the Japanese that the United States would discontinue work on the fortification of Guam and the Philippines, thus rendering war between the two countries unthinkable " since neither navy was formidable enough to be dangerous on the opposite side of the Pacific."

The parts played by leading Japanese statesmen are clearly set forth, and it is shown how Prince Ito, after being at first strongly influenced by Prince Bismarck, and introducing, as was necessary, an autocratic element into Japan's earlier constitutional efforts, was enabled by the gradual diminution of the power of the " Elder Statesmen " to sanction a comparatively liberal *régime*, which has since developed into something like universal suffrage. The character and policy of the great Meiji Emperor, who died in 1912 and with whose name is mainly associated the entry of Japan into the confraternity of the leading nations of the world, is depicted in glowing colours. The present Emperor has been able to throw off a good deal of the seclusion which marked what was held to be the semi-divine personality of his predecessors. He has done so without impairing the devotion and self-sacrificing loyalty of his subjects. With such a spirit Japan, with its 56 millions (exclusive of the 17 millions of Korea and the 3½ millions of Formosa), is a Power destined increasingly to make itself felt in the world, and especially in the Far East, where she is certainly now the dominating people. The steps by which she reached this position are admirably related by the Professor, whose book is much to be recommended even to such as have already made a study of the story of Japan. It contains much new matter and is accompanied by an admirable map including Korea and the adjacent parts of China.

MAURICE DE BUNSEN.

OP ZOEK NAAR DIEREN EN PLANTEN IN BRITSCH OOST-AFRIKA. By F. E. BLAAUW. *Amsterdam : Van Holkema & Warendorf* 1927. 11×8 *inches ;* 155 *pages ; map and illustrations*

We have here a narrative of travel in Dutch, not one of special geographical interest, but rather the journey of an observant naturalist through the territory of British East Africa. The author's journey begins at Mombasa, from which he works inland to Nairobi. Thence he makes two separate excursions : one westward to the Kedang Valley, the other north-east to the region round Mount Kenya. Many objects of interest were observed on these excursions. The game life, of course, comes in for attention ; but in addition there are many references to ornithology and tropical vegetation. The book is not a sportsman's record, but one to interest the lover of nature who delights in the wild magnificance of the tropics. A feature in the book is its profuse illustration. Some of the pictures are original, but many are those splendid photographic studies published elsewhere by Mr. Radclyffe Dugmore.

R. W. G. H.

THE BUILDERS OF AMERICA. By ELLSWORTH HUNTINGTON and L. F. WHITNEY. *London : Chapman & Hall* 1928. 9×6 *inches ;* xvi +368 *pages ; diagrams and illustrations.* 16*s net*

Having dwelt in his previous works on the influence of the geographical factor, environment, in the life, progress, and distribution of mankind, Mr. Huntington now turns his attention to the biological one, heredity, by an investigation, in collaboration with Mr. Whitney, of the present condition and future prospects of the people of the United States of America.

The question any one taking up this book will naturally ask is, What do the authors mean by builders ? He will find that the builders are those who in

virtue of superior intelligence and temperament are leaders in their several spheres. They are those who make " the country happier, more contented, purer, truer, wiser, and better in any other way." How many builders are needed in the United States of America to secure these desirable ends, and how many are actually available ? The answer is that the latter are much less numerous than the former. There is, in fact, a gap between the supply and demand of builders. If this gap is growing, as appears to be generally agreed, the sooner we realize the full significance of the fact, and do something about it, the better.

This is the problem the authors have investigated and are anxious to solve. Their conclusion is that it is essentially a question of birth-rate, and its successful solution chiefly depends on the builders having larger families than is at present the case. The birth-rate among many classes of builders is such that in a few generations there will be comparatively few left, whereas amongst the non-builders, and less intelligent members of the community, the birth-rate is much higher, and they are increasing in numbers. It is the same problem that since the Great War has been exercising the minds of thoughtful people in this and other European countries, where the increasingly small families of the better educated classes are contrasted with the much larger ones of the less educated, less intelligent, and unfortunate. It is the problem to which the science of Eugenics is especially directing attention, and suggesting methods of treatment which will arrest an evil threatening to deteriorate the race, and in consequence imperilling civilization.

This eugenic problem the authors consider in twenty-one chapters. The bearing on it of occupation, education, crime, marriage, divorce, feminism, and religion is studied in detail, much use being made of statistics drawn from college institutions like Yale and Harvard, and the record in ' Who's Who.' The general result of their inquiry is rather depressing. They point out that wonderful institutions are established to save human wrecks, but little or nothing is done to prevent the production of the bad human timber which causes the wreckage. As things now are the saving of wrecks is almost certain to cause still further wrecking, for the bad timber is straightway put into new ships.

In grappling with the difficult and complex question of how the evil is to be overcome by increasing the birth-rate of the builders, the authors are emphatic in their view that Eugenics is primarily a *social* problem, not a legal, political, or legislative one. They consider that the chief weapon to be employed is knowledge, its acquisition and its spread. To acquire that knowledge research is needed, and it is in support of this that great endowments are called for, so that the characteristics and significance of heredity may be studied and revealed. The authors are not out to offer a Utopia by any fanatical laudation of Eugenics. They conclude with a calm and moderate claim that whilst Eugenics is not a universal panacea and will not right all our wrongs, or cure half our ills, it will purge our social fabric of some of its most crying evils, will substitute an upward for a downward trend in the present rate of survival among the builders compared with the destroyers. It will make the family and children the centre of human thought as never before. In an appendix are collected a number of statistical tables and a bibliography. E. A. P.

A WAYFARER IN THE WEST INDIES. By ALGERNON ASPINALL. *London : Methuen & Co.* 1928. 8×5 *inches ; 244 pages ; illustration and sketch-map. 7s 6d*

Mr. Aspinall has in the present volume supplemented his two former books

on the West Indies (a Guide, and a series of Tales) by a survey of a number of the ever-sunny islands of the Caribbean, as well as of British Honduras and British Guiana, often regarded as Cinderellas of the Empire, but fruitful regions whose worth is increasingly appreciated. Many of the Greater and Lesser Antilles have had in the past golden periods of prosperity, and have fallen from their high place owing to economic troubles ; but, as Mr. Aspinall shows in his pages, frequently the disappearance of one industry has been followed by new development, and the most serious error of such highly favoured lands is to put all eggs into one basket.

With economics, however, the author is only casually concerned ; historical stories, and present-day description, occupy his pen. An extremely readable little book. L. E. E.

THE PROSPECTIVE DEVELOPMENT OF PERU AS A SHEEP-BREEDING and Wool-growing Country. By ALDRED F. BARKER. *Leeds : Jowett & Sowry Ltd.* 1927. 10×7 *inches ;* xii+174 *pages ; and illustrations*

As a report to the Peruvian Government written by the Professor of Textile Industries at the Leeds University, this book is necessarily more concerned with the technicalities of sheep breeding in relation to wool production, than with the more obvious kind of geographical matter. It aims at presenting in a scientific yet easily understandable form for the guidance alike of producers and manufacturers such material, and the conclusions drawn therefrom, as may be of service in furthering the sheep-breeding industry in Peru. As far as the layman can judge, the task has been well performed.

Prof. Barker has had the advantage of making a preliminary tour of the most promising sheep country on the Peruvian Plateau. He has further had the enthusiastic cooperation of Col. R. J. Stordy, of the Puno model farm, in the provision of many striking photographs taken in Peru and used as illustrations to the text, some seven of which are reproduced as autochromes of no small merit ; finally, but not by any means least, he has secured first-class services from the printers, who have given the report an almost lavish appearance in book form.

Though the ordinary reader finds little here about the geography of Peru, he gets by way of gleanings considerable information and various semi-technical sidelights on the production of one of the leading raw materials of commerce.

E. W. S.

THE ARUNTA : A Study of a Stone Age People. By Sir BALDWIN SPENCER, K.C.M.G., F.R.S., and the late F. J. GILLEN. *London : Macmillan & Co. Ltd.* 1927. Two vols. 9×6 *inches ;* xxviii+646 *pages ; numerous illustrations and diagrams, and two maps.* 36*s*

This work is a revision and extension of the same authors' previous book on the Arunta, ' The Native Tribes of Central Australia,' published in 1899. It is a monumental work, a treasure-house of exact observation and scientific scholarship. All the information it contains has been gained at first hand in the field and is the outcome of over thirty years' study of the Australian aborigines. For this study both authors had peculiar opportunities, for Sir Baldwin Spencer was Special Commissioner for the Government of Australia and Chief Protector of Aborigines in the Northern Territory, while Mr. Gillen was special Magistrate and Sub-Protector, Alice Springs. During the course of their investigations the authors lived with the natives in their camps, watching and studying them day and night, for months on end ; they were treated as fully initiated members of the Arunta tribe, and they witnessed important ceremonies—such as the Engura ceremony, which took four months

to perform—which no other white man has seen or will see, since they are now things of the past.

It was owing to the great changes that have taken place in the tribe during recent years that Sir Baldwin determined to get in touch with the Arunta again and revise the earlier work, though death had deprived him of his friend and former colleague. Thirty years ago the tribe numbered some 2000, to-day it is reduced to 300 or 400. There are few of the Arunta who have not been for years in contact with white men, but before it was too late and the old customs and beliefs have passed from the knowledge of the tribe, Sir Spencer has been able to amplify his previous account, mainly from information supplied by half a dozen surviving Oknirrabata—wise old men. The most important part of the new matter deals with the Alchera and Churinga beliefs and the origin of the totemic groups—the central tradition of the tribe. This, previously only known in part to the authors, is now fully described under the title of the Achilpa Tradition, and throws much fresh light on the meaning and significance of important features in various ceremonies.

The book is copiously illustrated and provided with an excellent index, and it is likely to remain for all time as the standard work on the customs, beliefs, and social organization of a tribe who were, in their former state, the most primitive of living people: living fossils, as it were, that serve to show us the mode of life of races which have long since disappeared. O. R.

THE MAORI PAST AND PRESENT. By T. E. DONNE. *London: Seeley, Service & Co. Ltd.* 1927. 9×6 *inches*; 287 *pages*; *plates, text-figures and map.* 18*s*

ROSSEL ISLAND, AN ETHNOLOGICAL STUDY. By W. E. ARMSTRONG. *Cambridge: University Press* 1928. 9×6 *inches*; xxviii +274 *pages*; *plates, text-figures and map.* 18*s*

The features in which these two books contrast with each other are numerous. One is a popular account of a well-known Polynesian people who had a relatively high culture of their own, but are now well on the way to absorption in a civilized community; the other describes the far more backward inhabitants of a small island in the Papuan group, and is the first systematic account to be published. For many of his facts Mr. Donne has been dependent upon the detailed researches of others, but his long and close acquaintance with the Maori of all classes enables him to paint his picture in more vivid and more human colours than are permissible to the scientific ethnologist. Mr. Armstrong, on the other hand, had only two months on his small island, but he devoted his whole time and energies to a detailed study of the simpler culture of his chosen people, whom he subjected to the rigours of a trained scrutiny. If the two books are in contrast with each other, the same may be said of the peoples studied, though the practice of cannibalism in both cases is one outstanding element of a common humanity.

It is not necessary to consider in detail Mr. Donne's presentation of the Maori, which is infused throughout with his admiration of a brave and able people, now providing " loyal, reputable, law-abiding " citizens of high aspirations. The author deals with much that is now gone beyond recall, and if we sometimes think that the old barbaric Maori must have been far more interesting than his civilized descendants, we have to recognize that the fault lies near at home. Since " the wealthy Maori is often a breeder and owner of race-horses," we cannot doubt that some of them at least have reached the highest levels of civilization, but that " there are now many hundreds of Maori girls who are proficient pianists " does not console us for the decline

of the arts and crafts which gave the Maori fame—in museums at least. But treasured oddments in museums are poor atonements for the death of a virile culture. Mr. Donne discusses the ceremonial life of the Maori, with its birth and death customs, tabu, tribal customs and organization, war and war-dances, and he gives a little space to material culture. For those who desire a general impression of the Maori and their beliefs and customs the book may be recommended, though it does not, of course, belong to the same class as Mr. Elsdon Best's recent volumes on these people.

Rossel Island, the scene of Mr. Armstrong's labours, is about 100 square miles in area, wooded, volcanic, and mountainous. It lies off the eastern end of the Louisiade Group (Papua), and has a humid climate with heavy rainfall, The natives are Papuo-Melanesian in general type, but darker in colour. broader-headed, and rather shorter in stature than the allied Massim people to the west ; from these they differ also in speaking a non-Melanesian language, as well as in their culture. They are convicted of ceremonial cannibalism, and they were guilty of a gastronomic extension of the practice in 1858–9, when some 320 wrecked Chinese are believed to have been assimilated in the space of a few months ; this was, however, an unusual opportunity, improvidently applied. They are totemic and god-fearing, with a sort of heaven, and another sort of hell ; some of their houses are pile-dwellings, and they make outrigger canoes ; they have no pottery, nor bows and arrows (except as children's toys) ; their arms are rough spears and missile stones. They are progressive in so far as their adzes now have blades made of iron obtained from wrecks, and also in their use of petrol for sorcery—by burning it in the footprints of a victim, who is seized with fever in consequence. One of the most interesting, and quite the most novel, features of the book is the account of the monetary system (shell money), which is associated with social customs and ceremonies. It may be noted that in connection with this system the natives are able to count up to 10,000, or even more.

Dr. Haddon's Introduction is a valuable discussion of the physical characters of the Massim, together with observations on points in the racial history of the area. This adds considerably to the importance of a book which will be welcomed by all who appreciate the value of scientific studies of peoples whose culture at least is doomed to suppression. H. S. H.

ETAH AND BEYOND ; or Life within twelve degrees of the Pole. By D. B. Macmillan. *London : Chapman & Hall* 1928. 9×6 *inches ;* xvi+287 *pages ; illustrations and maps.* 21*s*

The story of an arctic expedition is no longer a record of thrills, adventures, and hardships. The experienced arctic traveller like Dr. Macmillan knows how to equip and conduct an expedition so that its course is smooth and comparatively unadventurous. The expedition which is described in this volume was not one of exploration, but it entailed a far northern base, on the coast of Greenland in lat. 78° 31′ N., and several long journeys by land and over sea-ice. Its object was apparently twofold : to make observations in terrestrial magnetism and atmospheric electricity for the Carnegie Institution for Washington and, on behalf of the National Geographic Society, to erect a memorial at Cape Sabine in memory of the men who fell in the American polar expedition under General A. W. Greely in 1881–1884. Both aims were accomplished, and a third ambition, that of taking cinematograph films of arctic life, was fulfilled. Dr. Macmillan can write vividly. The lack of details of marching experience and the usual incidents of sledge travel is an advantage, for it leaves him free to write of arctic natural history and Eskimo life, two subjects

on which he is well qualified to speak. Few recent books on the Arctic are so full and accurate on these subjects, and the descriptions are enhanced by a number of excellent photographs. Dr. Macmillan rightly disparages the use of lime-juice and emphasizes the value of fresh meat in the prevention of scurvy; but when he says that C. F. Hall first showed the truth of this more than sixty years ago, he overlooks Dr. J. Rae and Sir Leopold McClintock, who long antedated Hall in this discovery. From his observations in Northern Greenland and Ellesmere Island Dr. Macmillan believes that "all glaciers in the Far North are again advancing." The Eskimo support him in this belief. This, however, does not agree with the experience of other observers who have found that the ice in Northern Greenland is generally stationary, and that several glaciers have retreated in recent years even if others have advanced. A criticism of early seamen, from the Norsemen to Cabot, on the score of their faulty navigation and consequent unexpected landfalls is somewhat harsh in view of those sailors' poor instruments, and surely it is a mistake to attribute "to an ignorance of magnetic variation" the confusion of the West Indies with India, Baffin Land with Asia, or the belief that the St. Lawrence led to Cipango. These however are but small blemishes in an excellent book. R. N. R. B.

PROBLEMS OF POLAR RESEARCH: a series of papers by thirty-one authors. Edited by W. L. G. Joerg. (Special Publication No. 7.) *New York: American Geographical Society* 1928. 10×6 *inches;* iv+480 *pages; illustrations and maps.* $5

The chief problems of polar research are here surveyed in a series of thirty-one papers written for the most part by men of experience in polar regions. The list omits several important names, for one reason or another, but all the same the field of research is well covered and no problems of importance are overlooked. To indicate all the subjects in this volume is impossible. Dr. F. Nansen, in a survey of oceanography, insists on the importance of tracing the extent of the continental shelf and whether it is below or slightly above water. He believes that a knowledge of the shelf itself is of more value than tracing and surveying the actual coasts of lands. He suggests that there may be volcanic islands or even volcanic platforms in the deep Arctic basin. Dr. A. P. Coleman, writing of the unsolved geological problems of Arctic America, suggests that the smaller channels of the Arctic Archipelago of Canada are drowned river valleys and not, as De Geer indicated, rift valleys. Mr. I. P. Tolmachev, in an article on the geological problems of Arctic Eurasia, discusses recent work which is mainly available only in Russian. He advocates specially exploration of the Arctic Sea in front of the old horsts which are the most probable localities for unknown land. Tidal results, including those of the *Maud*, are discussed by Mr. H. A. Marmer. He makes a slip in quoting Captain Amundsen as saying "there was no land" in his course in 1926 between Spitsbergen and Alaska, since in his book Captain Amundsen wrote, "We may have passed over islands at low altitude." Mr. N. A. Transehe offers a genetic classification of sea-ice, and with Admiral Kolchak agrees in differentiating between Arctic pack and pack-ice, the former being used for old rafted ice found mainly in the heart of the Arctic Sea, while pack-ice is ice on the outer zones that has drifted from its original position. But surely all the polar pack has drifted and is drifting, so that the distinction has little meaning.

There are several papers on the Eskimo. Mr. D. Jenness writes on the origin of Eskimo culture, and puts the problem of the relative ages of the Thule and

Cape Dorset cultures, which Dr. K. Rasmussen thinks were contemporaneous. Another problem is the migration route to East Greenland. Dr. L. Koch believes, as earlier authorities did, that there was a route by Northern Greenland, but Dr. Rasmussen dissents from this view.

Among important papers on the Antarctic is one by Sir D. Mawson on the chief problems of its exploration. He suggests that the Andean structure of Graham Land skirts the Pacific to King Edward Land, and that a crumpled moderately elevated area of newer geological formation may lie between that belt and the plateau edge that extends probably from the Ross Sea to Luitpold (Coats) Land. Professor E. von Drygalski gives a clear account of Antarctic oceanography. One of the problems on which he writes is the depth of the continental shelf—as low as 1000 metres. He is dissatisfied with the various explanations that have been given—ice erosion, isostatic sinking or faulting—though he admits the probability of the last in the Weddell Sea. The difficult problem of the air circulation in the Antarctic is touched on by Dr. Griffith Taylor, who finds little difference between the views of Dr. G. C. Simpson and Professor W. H. Hobbs, but devotes much of his chapters to discussing Antarctic influences on the weather of Australia.

Various papers on Arctic flying by Com. R. E. Byrd, Captain G. H. Wilkins, General U. Nobile and others afford valuable insight into the possibilities of this new mode of exploration. Mr. V. Stefansson, on the utilization of Arctic resources, is always interesting. And there are many other important papers. Maps (including a coloured bathymetrical one of the Arctic regions) and illustrations are excellent, and there are many bibliographical references and a full index. The book is an important addition to polar literature. R. N. R. B.

THE HUMAN HABITAT. By ELLSWORTH HUNTINGTON. (Library of Modern Sciences.) *London : Chapman & Hall Ltd.* 1928. 9×6 *inches ;* xii+294 *pages ; illustrations and sketch-maps.* 15*s*

To the present-day geographer the 'Human Habitat' should prove an attractive title. Our study of man in relation to certain associations of geographical factors has not kept pace with our knowledge of the factors themselves. There is room for detailed descriptive work here, showing in many and varied instances interadjustments of man with his environment. Such descriptive work forms a portion of this book, and not the least satisfactory portion. We are taken from the desert borderland of South-West Africa to the Equatorial Rain Forest ; from the Arctic home of the Eskimo to the terraced rice-fields of Japan ; and the descriptions are alive with significant detail.

Mr. Huntington can do this excellently ; but we expect something more from him, and assuredly we get it. He is not content with the description of static relationships ; indeed, he sees none. All is change, and for every change he has a reason. The fact is that the semi-popular mould of the series of which this book forms a unit is too slight a thing to contain the full treatment and support which the author's sweeping generalizations both merit and require. His statement, in the preface, that the book " does not pretend to present the proof of the many conclusions which it sets forth, for that has been done in hundreds of books and scores of articles " is, we think, correct only in part. For some of his conclusions, hampered as he is by the space and manner of the work, he gives—if not formal proof—yet very cogent reasons. For others we think the second part of the quoted statement too optimistic a reason for neglecting proof.

When we consider that in various parts of this work he deals—not explicitly but by implication—with such varied and disputable subjects as Natural

Selection, Selective Migration, The Urge of Climatic Changes in History, Climate and Mental Qualities—to name but some of them—we are not surprised that many of his generalizations are provided, in this work at any rate, with obviously inadequate support.

Thus we like best the early more detailed chapters which describe definite environments ; and least the later ones treating of " Health Energy and Progress " and the " Civilisation of Europe." The data on which his " Climatic Energy " and " Progress " maps are founded are not sufficiently stated. We think that more might have been made of the rapidity with which the incidence of a fresh culture may entirely modify the environmental controls. Mr. Huntington gives instances of this, but we should have liked to have seen the matter more stressed.

The present reviewer has at his disposal neither space nor knowledge sufficient for the proper treatment of a work of this kind. He would like to hear it discussed by a large circle of biologists, climatologists, anthropologists, physiologists, and last but not least, logicians !

To deserve such treatment a book must be, as this is, of wide interest, provocative, and stimulating. LL. R. J.

DE REIS OM DE WERELD door Olivier van Noort, 1598–1601. Met inleiding en aanteekeningen, uitgegeven door J. W. IJZERMAN. 2 volumes. (Werken uitgegeven door de Linschoten-Vereening, 27, 28.) *The Hague : M. Nijhoff* 1926. 10×6 *inches ;* viii+265 ; 300 *pages ; illustrations and maps*

This scholarly book forms a worthy addition to the list of works already published by the Dutch Linschoten Society. The famous circumnavigation of the Globe by Van Noort in 1598–1601 was the fourth of a series, his predecessors being Del Cano (1519–22), Drake (1577–80) and Cavendish (1586–88), but it was by no means the least eventful, as may be seen from a brief survey of it. Van Noort left Holland on 13 September 1598 with the *Mauritius* and *Eendracht* of Rotterdam and *Hendrick-Frederick* and *Hoop* of Amsterdam, the *Mauritius* being the " admiral " of the squadron. The voyage was not successful : the *Eendracht* became unserviceable and was burnt ; the *Hendrick-Frederick* stranded at Ternate and was sold to the king of that island ; and the *Hoop* (subsequently re-named *Eendracht*) was captured by the Spaniards in a battle in the Bay of Manila ; while the *Mauritius*, narrowly escaping a similar fate, returned alone to Holland with fewer than 50 men left of the 248 the expedition had set out with. Nor had the commercial side of the venture better success. But the voyage was a notable achievement, nevertheless, and great credit is due to Van Noort for the way in which he carried on his voyage in face of repeated set-backs and disasters, some of which, it must be admitted, were largely due to his own faults.

In December 1598 the squadron touched at the Portuguese island of Principe to water, where it lost several men in an unsuccessful skirmish with the Portuguese. Further time was wasted at Anobon and the squadron subsequently touched at Rio de Janeiro. Shortly afterwards the *Eendracht* was abandoned, and the remaining three vessels after a tedious passage of 116 days (100 more than the time taken by Drake), passed the Strait of Magellan in March 1600. Van Noort was not able to effect any captures of importance off the Pacific coast of South America, for the Spaniards had profited by the lessons learnt at the hands of Drake and Cavendish and were prepared to meet him. As he felt himself unable to cope with their greatly superior forces he set sail for the Philippines, with the hope of capturing a silver-ship from thence. One

ship indeed—the *Buen Jesus*—which he had taken off the Chilean coast had been laden with treasure (some 10,200 lbs. of gold), but the Spanish captain had thrown it all overboard before his vessel was taken.

The *Mauritius* and *Hoop* reached the Philippines in October 1600, where they cruised for some time, making prizes of several Chinese and Japanese junks. On December 14 they were attacked off Manila by a Spanish galleon—the *San Diego*—and a " galizabra "—the *San Bartolomé*—under the command of Antonio de Morga. The *Mauritius* was boarded by the *San Diego*, and the Spaniards speedily made themselves masters of the upper works and deck. The Dutch crew retired below and at one time showed signs of yielding, but Van Noort seized a lighted torch and threatened to blow up the ship should they do so. This so impressed his crew that they renewed the struggle and forced the Spaniards back on their own ship, which got loose and sank in a few moments with great loss of life. Meanwhile the *Hoop* had been overhauled and boarded by the *San Bartolomé*, and her crew surrendered on promise of life—a promise which was afterwards inhumanly violated in Manila. The *Mauritius* continued her voyage to Borneo and thence to Madura and Java. After a short stay in this part of the Malay Archipelago the *Mauritius* continued her homeward voyage *via* the Cape of Good Hope, and arrived in Holland on 26 August 1601, having met with no further adventure worth relating.

Among the most interesting parts of the book are the description of the Chinese and Japanese junk trade to Manila, and Van Noort's fights with the Spaniards in the Philippines. The work is beautifully produced and supplied with excellent maps, a very full bibliography, and index. C. R. B.

THE ROYAL TOUR OF THE DUKE AND DUCHESS OF YORK. By TAYLOR DARBYSHIRE. *London : Edward Arnold & Co.* 1927. 7×5 *inches ;* xii+304 *pages, and illustrations.* 7*s* 6*d*

The duties of Royalty on tour are apt to be exacting, and the official journalist's in selecting the material for writing a vivid account of a Royal Tour not less so. Functions, ceremonies, addresses, and ovations occupy so much time and attention that the inward spirit of the places visited, their setting, the interesting natural features, are given but fleeting glimpses or are even altogether neglected.

From a geographical standpoint such a book as this cannot in any case give very much that is new, since the route chosen is naturally such that it takes in one populous and representative centre after another. Only very occasionally does the party escape from towns and crowds into the domains of nature.

Mr. Darbyshire's book forms a pleasantly readable account of the royal journey round the world. It is written in a brisk vein, with an eye not only to the distinguished travellers and their doings, but also to the striking incidents, and the interesting persons and things met with on the way. There is no question that the object of the tour in cementing the bonds of Empire were fully accomplished, and it is fitting that some accurate and readable record of it, such as Mr. Darbyshire has prepared, should be available to all of British race and allegiance. E. W. S.

INDIA BY AIR. By Sir SAMUEL HOARE. *London : Longmans, Green & Co.* 1927. 8×5 *inches ;* xx+156 *pages ; illustrations and sketch-map.* 6*s* 6*d*

This book has an interest of its own as the account of a flight to India which may be regarded rather as the first of a hoped-for regular series than as a pioneer flight in the usual sense of that term. It was carried out to a regular time-table and without any sensational variation from its plan. This fact was the outstanding feature and the chief merit of the flight, since it gives evidence that most of the physical and mechanical difficulties have been overcome.

Several of the photographs used as illustrations have considerable value as views of distinctive types of scenery, especially those of the desert and of some of the arid mountain country of the North-West Frontier of India. It is a minor comment that for one stage—Khoms to Benghazi—the route shown on the outline maps printed as end papers differs somewhat from that described in the text.

The route followed is one of the most obvious—across France and by the west coast of Italy to Malta, thence to Tripoli and along the coast to Palestine and on to Basra, from which it was again coastal to Karachi. It is clear that the development of such long-distance air-routes will raise new problems in the communications of the Empire, particularly in its political relations.

The book is well printed and illustrated; but its price seems high for the amount of matter in it. C. B. F.

REMINISCENCES OF ADVENTURE AND SERVICE. By Major-General A. W. GREELY. *New York: Charles Scribner's Sons* 1927. 9×6 *inches;* xii+356 *pages; illustrations.* 15*s*

To the geographer the main interest of General Greely's book lies no doubt in the fresh account which he gives of the Arctic Expedition of 1881–1884. Writing after forty years the leader is able to confirm his earlier judgments both of the men and the events, and of the self-sacrifice and devotion which were such conspicuous features of the ill-fated expedition. Apart from that, the book contains accounts of pioneer life in the Western States and more particularly of the difficulties of maintaining telegraphic communication in the seventies and eighties of last century. Some new sidelights are thrown on the Spanish-American War. All that General Greely writes is of interest, and equally so is the unconscious revelation of a life marked by high integrity and devotion to duty. J. M. W.

THE ELEMENTS OF ECONOMIC GEOLOGY. By J. W. GREGORY, F.R.S. *London: Methuen & Co. Ltd.* 1928. 8×5 *inches;* 312 *pages;* 63 *illustrations.* 10*s*

Professor Gregory has interpreted Economic Geology in a broad sense, and yet has contrived to compress an outline treatment of the whole into the brief space afforded by 300 pages. Written in a terse, almost jerky style, it would be difficult to find a geological text-book more closely packed with information. The author, as is well known, is a man of unusually wide interests and unusually extensive experience, and the reader of this book benefits by both. In a few words the non-scientific reader will find answers to questions of current or everyday interest which are neglected in larger treatises. What is kerosene? How did Noah caulk the ark? How does water become hard? At what rate is England growing at the expense of the sea? are all examples of questions answered by a single sentence. It follows inevitably that the book is dogmatic—"if the book had been twice as long some views would not have been rejected with the apparent dogmatism rendered necessary by the limitations of space." To a considerable extent, however, the author disarms criticism in this particular by giving very numerous references to original sources of the most varied character.

Rather more than half the volume is devoted to the consideration of ore deposits. Though frankly favouring one school, the author gives a clear summary of the varied theories of ore formation, and this is perhaps the best part of the book. On the other hand, to treat of modern soil science in less than seven pages is beyond even Professor Gregory's powers of compression.

L. D. S

AN INTERMEDIATE COMMERCIAL GEOGRAPHY. Part I. Commodities and World Trade. By Dr. L. D. STAMP. *London: Longmans, Green & Co.* 1927. 9×5 *inches;* xvi+262 *pages; diagrams and maps.* 7*s* 6*d*

This volume is part of a textbook for first-year University students, and follows a usual plan in devoting chapters to "Modern Geography," "The Structure of the Earth," etc., before reaching its avowed topic of Commercial Geography. Chapter iv on "The Major Natural Regions of the World" is one of these introductory studies; but in this case it is no mere compilation. Dr. Stamp has here presented a scheme of Regions, frankly based on Professor Herbertson's, which shows interesting developments of his own, particularly in tropical and subtropical latitudes. This chapter deserves the attention of geographers, and a fuller exposition and criticism than it can get if published only in this form.

The book contains 200 diagrams, nearly all of which are clear and effective, and the text is closely packed with statements of fact. In fact, the chief adverse criticism is that it is too crowded. If the promised Part II is to be like it the total will be far too great for the assimilative powers of the students for whom it is intended. Also many parts suffer from excessive condensation; we may instance as examples the account of railway gauges and their distribution, given in twenty-seven lines of text and one diagram, and of Ocean Transport in nine pages, which include four diagrams. In these and other cases the condensation leads to statements which badly need qualification.

Some errors are inevitable in the first edition of such a work. The small number of those we have found is a testimony to great care on the part of the author and publishers. But it should not be necessary to-day to protest against the use of a world map on Mercator's net to illustrate comparisons of area (Fig. 11). The description of rainfalls above 80 inches (tropical) and 40 inches (temperate) as "good" may be questioned. In some cases such rainfalls are excessive, in the true sense of that word. The list of the chief areas of the British iron and steel industry given on p. 224 does not include Middlesbrough or the Teesmouth district. On Fig. 53 it is assumed that the Coniferous Forest areas are identical with the regions termed "Cold Temperate" without any note of the exceptional case of British Columbia and the north-western corner of the U.S.A.; while Fig. 193 marks Egyptian railways as "standard" gauge.

The book is well produced, in a form to withstand hard wear; and all teachers of the subject would do well to make use of it. C. B. F.

PRACTICAL HINTS TO SCIENTIFIC TRAVELLERS. Edited by H. A. BROUWER. Vols 3, 4, and 5. *The Hague: Martinus Nijhoff*, 1925–7. 8×5 *inches;* vol 3, 185 *pages;* vol 4, 171 *pages;* vol 5, 173 *pages; illustrations and maps.* 5 *gulden each*

The first two volumes of Professor Brouwer's useful work were reviewed in the *Journal* (64, p. 73; 66, p. 468). Volume 3 contains papers on Mexico, Indo-China, India and Burma, New Zealand, New Guinea, and Morocco. Volume 4 deals with Egypt, Angola, Australia, Antarctica, Venezuela, and Haiti; volume 5 with Ecuador, Eastern Congo, Northern Manchuria, and the Malay Peninsula. Each paper is written by an expert on the country described, and all the papers are in English, with the exception of those on Indo-China and Morocco (in French), and Northern Manchuria (in German).

Dr. Brouwer is to be congratulated on his enterprise, and we hope it may receive the support it deserves. The papers are well illustrated and the majority are provided with maps. They vary in length and in value. For

example, the paper on Ecuador, by H. Adrian and H. Hintermann, to which fifty-eight pages are devoted, contains particulars of how to reach the country, formalities on arriving and leaving, monetary conditions, health, museums, mode of travel in the various geographical areas, equipment necessary, and concludes with a section on the natives and a bibliography. In a work of this kind, which does not pretend to be more than introductory, the bibliography is essential, yet the paper on the Malay Peninsula, by J. B. Scrivenor (a matter of only nine pages), contains merely a reference to the source of scientific papers and gives no detailed references to the considerable general literature on Malaya. This paper is too sketchy to be of much value, and although the author devotes a page of his space to the subject of leeches, he does not warn travellers that a leech, once attached to the person, should never be picked off, but persuaded to withdraw by means of a lighted cigarette end, otherwise a troublesome ulcer may ensue. O. R.

BIRDS OF THE OCEAN. A Handbook for Voyagers. Containing descriptions of all the sea-birds of the world, with notes on their habits and guides to their identification. By W. B. ALEXANDER, M.A. (CAMB.). *London and New York : G. P. Putnam's Sons* 1928. 7×4 *inches ;* xxiii+428 *pages ;* 88 *plates (mainly from photographs).* 15*s*

Ocean travellers the world over will be grateful to Mr. Alexander for this little book. Even the trained ornithologist finds the problems presented to him on an ocean voyage impossible to unravel, for it is one thing to know a bird mounted in our museums, but quite another to recognize the same species as it swiftly passes our steamer or follows in its wake.

The true value of a book of this nature cannot be gauged until opportunity has occurred of using it " in the field," but, even without putting it to this severe test, the reviewer can strongly recommend all ocean voyagers to carry it with them. Mr. Alexander knows his sea-birds well and has arranged his notes so that they are easily accessible to the reader. In matters of nomenclature, as in the range which he gives of each species, the author is up to date, and the few mistakes noticed do not concern us here. The photographs are excellent, and Mr. Alexander's diagrammatic drawings should prove most helpful.

' Birds of the Ocean ' is a true handbook which, with its rounded edges, will conveniently slip into any pocket ; it has filled a real gap in bird literature, but the price—even in these expensive days—is quite excessive, for it has not been exceptionally well produced. D. A. B.

A HISTORY OF SKI-ING. By ARNOLD LUNN. *Oxford : University Press* 1927. 9×6 *inches ;* xvi+492 *pages ; illustrations.* 16*s*

Mr. Lunn's enthusiasm for ski-ing has produced a book which no ski-runner should miss. After a few notes on the early history of ski-ing, a part of the subject which has been treated in other books, and some chapters on the history of Central European ski-ing, the main part of the book is devoted to British ski-ing, that is to say, ski-ing by British exponents of the sport. This part of the book is full of detail and reminiscence, and records the names and particulars of all the great feats and races. In view of the present vogue of ski-running it is surprising how recently the pastime took hold among Englishmen. Not until the eighties of last century did Englishmen first take ski to Switzerland, and not until this century did the sport become at all popular. The Ski Club of Great Britain was founded in 1903, and the Scottish Club in 1907 ; but the British climate allows small chance of good ski-ing in our islands. It was on Swiss snowfields that British ski-runners developed

their skill. To Mr. Lunn ski-racing is the culmination of skill in the use of ski, but he is not blind to the fascination of touring and jumping. While much of the book is too technical to appeal to any but ski enthusiasts there is a great deal of general interest in the relation of ski-ing to mountaineering, and the whole makes a valuable record. R. N. R. B.

THE MONTHLY RECORD

THE SOCIETY'S MAP CURATOR

We offer our hearty congratulations to Mr. Reeves, the Society's Map Curator and Instructor in Surveying, on completing 50 years' uninterrupted service on the Staff of this Society. It is given to few to look back upon so many years' useful service to one and the same institution, and we feel sure that the recent award to him by the Council of the Victoria Research Medal, particularly appropriate in this connection, has been received with sincere satisfaction by his many friends in the Society—many of them also his old pupils. It has given great pleasure to his colleagues on the Staff, who wish him continued health to carry on the excellent work which has been so widely appreciated.

GIFT TO THE SOCIETY'S MAP COLLECTION

Once more the Society is indebted to the liberality of Mr. W. A. Cadbury for an interesting addition to its collection of old maps. It is a composite volume, formerly owned by William Burton, author of the History of Leicestershire (1622), containing a collection of maps, mostly of the late sixteenth century, some of them excessively rare. The two largest components are (1) a slightly incomplete set of the maps issued in 1595 as the final instalment of Mercator's Atlas, first edition ; (2) a set of Saxton's county maps, also not quite complete, to which are added as an appendix the fine set of engravings by Ryther illustrating the succession of fights with the Spanish Armada during its progress up the English Channel. While all these are far from common, there are two single maps which may be counted among the greatest rarities of the period. The first is Hondius's World in Hemispheres, showing the routes of Drake and Cavendish in their voyages of circumnavigation, on the back of which are pasted portraits of the two navigators done by the same engraver. These appear to have been known hitherto only from the versions given with the letterpress pasted at the foot of the same map in the British Museum specimen, which are without signature or any indication of date. The versions now brought to light are evidently the originals from which the others were copied, and they are authenticated by Hondius's signature with the interesting addition " fecit Londini," showing that they must have been made at least not later than 1593, for before the end of that year Hondius was in Amsterdam, as shown by the record in the City Registers of the baptism of his son on November 9. Besides being of superior workmanship they differ from the copies in their slightly larger size, and in the fact that Drake's route is more correctly shown in the minute map placed below the figure, the copies having made practically no difference between his route and that of Cavendish. The direction in which they face is also reversed in the copies.

An equal rarity is a map of the British Isles (omitting the northern parts of Scotland), which appears to have been virtually unknown in modern times until a copy was found in 1926 in an Ortelius Atlas of 1595 acquired by Dr. F. C. Wieder. An inscription at the top tells that it was " ad Camdeni Britan-

iam accommodata," a statement borne out by the insertion of ancient, side by side with modern, names over a great part of the map. It contains also a little-known portrait of Queen Elizabeth in the centre of a genealogical tree on the right-hand side of the map. (This seems to be the one mentioned by O'Donoghue in his catalogue of portraits of the Queen as occupying a similar position, though with no indication of provenance.) Unfortunately the map is not quite perfect, having lost a narrow strip both on the bottom and right side, and the date, which we know from Dr. Wieder's copy to have been 1594, is thus missing. The map seems to have been itself based on one engraved by Hondius in 1592, of which Dr. Wieder informs us he has lately secured a copy (somewhat larger than the map of 1594 and without the Queen's portrait), which appears to be unique. A later copy, included in the 1606 English edition of Ortelius, while almost identical in the map proper, proves to have been re-engraved throughout, and also lacks the portrait.

The former ownership of the volume by William Burton (whose name appears on a portion of the original cover pasted on the later binding) gives it an additional interest, particularly as the Saxton Map of Leicestershire has his MS. additions of many places not shown in the original, which additions, as we know from a statement in his history of the county, were embodied in the rare map engraved by Hondius in 1602 (see *Journal*, 68, p. 334; 69, p. 86). Burton has also been at pains to distinguish, by the symbol used, between churches with spires and those with towers only. Lastly, the volume supplies a possible clue to the date and circumstances of one of the re-issues of Saxton's Atlas, suggesting that the plates may have fallen into the hands of Ryther—one of the original engravers, who is known to have himself kept a shop for the supply of maps and other documents. The paper of many of the Saxton maps in this volume is the same as that used for the Armada plans, known to have been Ryther's enterprise, and the set of these owned by the British Museum is also on the same paper as that of the copy of Saxton with which they are bound. This may be a mere coincidence, but one is tempted to conclude that the two works were issued as companion volumes in 1590.

SNOWSTORMS IN SOUTHERN ENGLAND

The dark days of last December brought a penetrating cold with continuous frost day and night for a week and a few preliminary falls of dry snow locally heavy. But when a warm thaw, introduced by a dangerous glazed frost, suddenly supervened a few days before Christmas, expectation of something like a " historic " snowstorm dwindled. But in our climate big storms of any kind have a way of appearing to retreat for a day or two only to gather force for a more violent effort. Exactly so did the snow suddenly arrive on Christmas evening after a day of torrential rain. An instructive record, with excellent illustrations, of what over much of Southern England was an impressive visitation has been brought out by the Rev. H. H. Breton, vicar of Dean Prior, Buckfastleigh, Devon, who is an experienced meteorological observer (' The Great Blizzard of Christmas, 1927 : Its Causes and Incidents,' Plymouth : Hoyten & Cole, 1928. Price 2*s*.).

A somewhat unusual feature of the storm was that owing to the influx of a relatively warm air current from the North Sea into the responsible cyclonic system the snow was much moister in the south-eastern than in the south-western counties of England, which were receiving colder supplies of air. Thus in the south-east it was only on the high ground of the Chilterns and North Downs, and in parts of East Anglia, that between 1 and 2 feet of snow fell, with heavy drifting which isolated villages. Inner London escaped with

only 6 inches, and the coasts of Kent and Essex had no snow at all except for a heavy fall of sleet. Westward of Hampshire, however, the snow was quite dry, falling to a depth of 1½ feet, with 15-feet drifts over the lower parts of Wiltshire, Dorset, Devon and Cornwall, and in enormous quantity upon the uplands of Salisbury Plain, Exmoor, and especially Dartmoor, where the fierce easterly gale formed accumulations in the gulleys up to 60 feet in depth. The intensity of the downfall on Dartmoor during the early stages of this 48-hour storm must, indeed, have been very great, for within a few hours of its commencement no train or motor car could leave or approach Princetown, which was in a state of siege for many days, with snow in the streets often up to bedroom windows. Hundreds of sheep and ponies were of course buried, and many perished, on Dartmoor and Exmoor; but more gruesome was the discovery in a great drift on Salisbury Plain of a motor cycle with its rider frozen to death. A complete break-up of the hard frost at the New Year, leading to serious floods, relieved a situation which was becoming very difficult and would have necessitated the provisioning by aircraft of many villages had further snowfalls ensued. As it was, in spite of a wet frostless January, remnants of the great drifts in Hampshire, Wiltshire, and Devon were still lying towards the end of February.

Leaving out of account the more northern and mountainous parts of Britain, the snowstorm of 25 to 27 December 1927 has had only two rivals in the southern half of England in the last fifty years, namely 18 to 21 January 1881 and 9 to 12 March 1891. In 1881, when the snow was everywhere dry and powdery, the area most heavily visited was almost identical with that in 1927; but in 1891 it lay in the extreme south-west, in Devon and Cornwall, where both wind and snow were worse than in either 1881 or 1927. By reference to *The Times* for the middle of March 1891, or to a little book, now very scarce, entitled 'The Blizzard in the West, March 1891,' we find that passengers in a main-line express between Paddington and Plymouth had to spend four whole days at Brent, on a southern spur of Dartmoor, and that others in a branch-line train, which was imprudently despatched from Princetown to Plymouth, were rescued only just in time after having spent thirty-six hours in that train charged with snow up to the hat-racks. And along the Cornish coasts over a hundred lives were lost by shipwreck. The late Mr. Baring Gould refers to an accumulation of snow in the deep ravine known as Tavey Cleeve 300 feet in depth which had not all gone by June 1891. From the late Mr. Gethin Jones' careful study of the drift-lines on the Snowdon range ('British Rainfall,' 1909) it appears that with only a 2-foot snowfall drifting of this order of magnitude is quite feasible under favourable conditions.

THE "ARMAND" POT-HOLE IN THE CAUSSES

This remarkable "aven," or pot-hole, situated in the Causse Méjean in Lozère, was first explored by Mons. E. A. Martel, the well-known French speleologist, so far back as 1897, in company with its discoverer, Mons. Louis Armand, whose name it now bears. But it is only quite lately, thirty years after its discovery, that steps have been taken to make it easily accessible to the public. In view of the new developments M. Martel, who published a description of the aven in 1899, has now written an illustrated pamphlet (Millau, 'Imp. Artières et J. Maury,' 1927 *), in which he not only gives a full account of its position, surroundings, and special features, but discusses its mode of formation and the general characteristics which it shares with similar natural

* This date appears on the cover and on the last page of the text, but the actual title bears the date 1897.

wonders elsewhere, with notes on its discovery, the steps taken to throw it open, and the part played by Armand in French cave exploration. The Armand Aven lies a little north of the course of the Jonte, an upper tributary of the Tarn, and can be reached by motorists from Meyrueis on that river by first following the St. Enimie road for 8½ kil. and then turning west by a road specially made in 1926. The Causse Méjean is an expanse of Jurassic limestone, devoid of water or trees, at an average elevation of 1000 metres, though its highest and lowest points differ by 472 metres, so that it is by no means a monotonous dead level. The upper part of the Aven is a funnel 10 to 15 metres in diameter, but this is continued by a well or chimney with perpendicular sides, 3 to 5 metres in diameter, leading down to an immense grotto. This is exceeded in size by various grottoes in other parts of the world, but nowhere else can be found so wonderful a collection of stalagmites, forming towers and pinnacles up to 100 feet in height. The forms these calcite monoliths take are extraordinary, some representing veritable trees in stone, their leaves formed of plates several decimetres across. A group of these, known as La Forêt Vierge, is crowded into an area of less than 2000 square metres, some too close together to allow one to pass between them. Some have a diameter of 3 metres, while others are slender stems only a few centimetres thick, and the wonder is that they have not been overthrown by some earthquake shock. The origin of the lateral flakes has been much discussed, but M. Martel attributes it to air currents, which, coupled with the great depth to which the drops of water fall, permit a considerable lateral displacement. Marks made in 1897 on one of the stalagmites most exposed to drip show that there has been an increase in height of only 1–2 mm. in twenty-nine years. The Aven itself is no doubt, like others elsewhere (including Gaping Ghyll in Yorkshire), the " swallow-hole " of an old torrent.

ARCHÆOLOGICAL TOUR IN WAZIRISTAN

Sir Aurel Stein asks us to state that the archæological tour along the Waziristan border, which he described in the April *Journal* (71, 377–80), was carried out under the orders of the Government of India, and at the expense of the Archæological Department. He has prepared a detailed report on the results of this expedition, illustrated with numerous plates, and this will shortly be published as a *Memoir* of the Indian Archæological Department.

As the complement to this expedition, and under the same auspices, Sir Aurel spent the 1927–28 field season in Baluchistan. The chief areas he examined were Kharan and Makran, his researches extending to the Arabian Sea coast and the Persian boundary. Many prehistoric sites were found, the more important being partially excavated. The results showed that the arid regions of Southern Baluchistan were once the home of an early civilization related to that which Sir Aurel Stein had traced in the desert south of Sistan. He is at present engaged in preparing a detailed report.

AFRICAN RAILWAY DEVELOPMENT

In recent months considerable work has been carried out in the development of African railway systems. It will be remembered that the East African Commission reported in favour of railways rather than roads as communications in tropical Africa. This year two sections in East Africa have been completed. The branch from the Tanganyika Central Railway at Tabora has been carried to Mwanza, on Lake Victoria. The first 80 miles to Kahama make use of the earthworks built for the projected German line which was to open up Ruanda and Urundi. From Kahama the line makes a détour to the

east to avoid a belt of sleeping-sickness country, and also to tap the populous agricultural districts around Shinyanga and Nzega. This district has a growing export trade in cotton, ground-nuts, hides, etc., which will benefit by the advent of the railway, not least from the release of potential agriculturalists from uneconomic transport work. The Commission ascertained that at Tabora in 1924, 4000 tons of ground-nuts brought in to the railway had been carried, on an average, 100 miles on the heads of natives. This branch line will also serve, if necessary, as an alternative outlet for the cotton and other exports of Uganda. It has been arranged that this line shall not compete with the Uganda–Kenya Railway. A further extension to the latter line has also been opened recently. From the branch which leaves Nakuru in the direction of Mount Elgon, a line, 184 miles long, has been built to Mbulamati on the stretch of rail connecting Lakes Victoria and Kioga. The Nile is thus brought into connection with the Indian Ocean. It is probable that this line will further be extended through Jinja to Kampala, the commercial centre of the country.

In Western Equatorial Africa, also, railways are developing. An important link in the communications of the Belgian Congo was to be opened in June last. This is the 240-miles stretch of railway between Bukamba, Katanga, and Ilebo (Port Francqui) on the Kasai. This provides a new route to Katanga ; the Kasai between Ilebo and Leopoldville is navigable, and from that place there is railway connection with the ocean port, Matadi. It has also been decided to continue the line from Ilebo to Leopoldville, about another 400 miles. When this is completed there will be through railway connection between Matadi, Elizabethville, and Cape Town. This Bukamba–Ilebo (Bas Congo–Katanga) line will be an alternative route for the Katanga exports to the Benguella railway, which is nearing completion (*G.J.* 71, 106), and the Central Tanganyika Railway.

Progress is being made with the Brazzaville line in French Equatorial Africa, though there has been some difficulty in obtaining adequate supplies of labour. Its ocean terminus is Pointe Noire, where a 350-metre concrete wharf is being built, which will eventually be replaced by a deep-water harbour. Seventy-five kilometres of line have been laid to the east, and are now operating. At the Brazzaville end, 95 kilometres of earthworks with a temporary light track have been built. This narrow-gauge line should reach Mindouli this year. The completed line should be opened within five years.

In Nigeria the construction of a bridge over the Benue, linking the two sections of the Nigerian Eastern Railway, has been begun. At present communication is maintained by a ferry service. The bridge will be 2584 feet long, with thirteen spans, the longest, it is stated, in Africa. The Eastern Railway from Port Harcourt runs through the coalfields of Enugu and Iva valley : its northern section, in conjunction with the Western Railway, serves the tin-fields of the Bauchi plateau. These have been handicapped by the lack of cheap fuel supplies ; the completion of the bridge will bring the southern coalfields into touch with the industrial areas of the north.

Finally, it may be noted that the project of a Trans-Saharan railway has entered upon another stage. Earlier in the year a bill for the study of the scheme was introduced by the Minister of Public Works into the French Chamber, and the sum of eleven million francs, contributed by the governments and bodies interested, is to be devoted to this. Whatever the ultimate outcome, the scheme will continue to bear fruit in increased knowledge of this region of Africa.

EXPLORATIONS IN ALASKA

An area of considerable interest geographically, lying along the north-western flank of the Alaska range which culminates in Mount McKinley, was explored in 1925 by Mr. Stephen R. Capps, well known for previous research in Alaska, on behalf of the U.S. Geological Survey, and his report was issued last year by that body (Bulletin 792—C). The region examined was difficult of access and little visited until the completion of the railway from Seward to Fairbanks in 1923. It was partially explored by Brooks in 1902, as well as by several of the mountaineering expeditions to Mount McKinley, and Mr. Capps himself had done previous geological work in the same region, to extend which was the object of the expedition of which the results are now recorded. Summer travel in the marshy or timber-clad lowlands beyond the range is exceedingly difficult, while the rugged and ice-clad nature of the higher parts of the range is an equal hindrance, so that attention was concentrated on the intermediate belt of 15 to 25 miles' width, lying along the north-west flank of the highest part of the Alaska Range. As large areas on both sides are always snow-clad, all the main valley heads are occupied by glaciers. The crest lying much nearer the north-west side, there are here many short parallel valleys, each occupied by a small glacier, in contrast to the elaborately branching valleys of the other side, where the ice-tongues converge into major trunk glaciers. Muldrow glacier, draining the north-eastern slopes of Mount McKinley, differs from both forms in occupying a valley parallel to the axis of the range. Its length is 44 miles, and with its branches it covers an area of 75 sq. miles. All the larger rivers rise in the glaciers and, being fed by melting ice, have an extremely variable discharge. They build up extensive valley-floor deposits of gravel and sand, over which they flow in braided channels. About three-fourths of the area falls within the basin of the Kantishna river, but one or two are head-streams of the Kuskokwim. All can be forded on horseback in ordinary summer stages, but fording on foot is dangerous except at low water. The range is bordered on the north and west by a great lowland in which the detritus from its erosion has been deposited ; the general elevation is about 1000 feet, but it may reach 3000 along the margin of the range, which however rises abruptly from it without intervening foothills. With the exception of Muldrow glacier, which extends several miles into the lowland, the ice-tongues reach only to the face of the range. The annual precipitation is generally light, though the snowfall in winter is considerable in the mountains. The Alaska Range proper is here practically devoid of trees, but the lowland below 2000 feet contains timber, not of large size, and it extends to 2800 feet in the main river valleys. Game is abundant. Apart from a few miners and prospectors the region is uninhabited. The report enters fully into the geological structure. Palæozoic formations are well represented, the oldest being possibly pre-Cambrian. Certain greenstones are probably Mesozoic, and there are granitic intrusives probably of Jurassic age, while there are three formations of Tertiary age.

The same Bulletin contains a report by Philip S. Smith on Geologic Investigations in Northern Alaska, carried out in 1925 by Messrs. G. FitzGerald and W R. Smith, in continuation of work done in the previous summer. From Kotzebue the party ascended the Noatak and a northern tributary, then crossing the divide into the basins of the Utakok and Colville rivers, flowing to the Arctic Ocean. The upper basin of the Colville was surveyed (either on the ice or by boat), and a return south made by its tributary the Etivluk. During its ascent in boats, dogs were used with good effect for hauling on the tow-lines.

THE TREELESS PAMPAS

With reference to our note on this subject (*G.J.* 71, p. 108), giving the substance of an article by Mr. O. Schmieder published last year, Mr. Charles Jewell writes expressing a doubt whether Mr. Schmieder's belief that the Pampas were once tree-covered, but have been rendered bare by the action of fire, is to be accepted. From his experience of prairie fires, he doubts whether they would do much damage to most kinds of *monte*, and thinks that if the suggested cause of the treelessness were true we should still see traces of roots or burnt stumps. He also contests Mr. Schmieder's statement that trees grow easily wherever planted in the Pampa. This may be true of one species—the *Paraiso* (though even this would not *spread* easily), but the difficulty in other cases is to get the saplings to take a good hold in the unfavourable conditions of fierce heats or strong frosts, droughts or excessive rains, and strong winds. The depth of the water-table is held to be an almost insurmountable difficulty. As regards the early records of former forests, he suggests that these apply chiefly to the river-courses, the sole channels of communication used by the early Spaniards. To some of these objections it might perhaps be replied that the destruction was wrought so long ago that traces of fires could hardly be found now; also that the present depth of the water-table might itself be a result of forest destruction in the past. The view that the treelessness of the North American prairies is a result of fires has, however, been also questioned, as by Mr. J. W. Redway in this *Journal*, 3, pp. 209 *et seq.*

EQUATORIAL ISLANDS OF THE CENTRAL PACIFIC

In 1924 an American expedition in the *Whippoorwill* visited the scattered atolls of the Central Pacific, near the Equator, in order to study the almost unknown plant-life of these islands, the field-work being carried out by Prof. H. J. Bergman (who undertook the systematic collecting of the plants) and Mr. Erling Christophersen, who devoted himself to the ecological aspects of coral island vegetation. The latter has recorded the results of his researches in Publication No. 2 of the *Whippoorwill* Expedition, forming *Bulletin* 44 of the Bernice P. Bishop Museum at Honolulu. Besides the botanical matter it contains some valuable notes on the climate and general features of the islands. These form two groups, an eastern consisting of Palmyra, Washington, Fanning, Christmas, and Jarvis, and a western formed of Howland and Baker. On another basis they may be divided between a wet belt north of the Equator (including Palmyra, Washington, and Fanning), and a dry belt adjoining the Equator, with Christmas Island on the border-line. All are atolls of coral origin, Christmas, Fanning, and Palmyra having open salt-water lagoons; Washington a closed fresh-water lake; and the rest no water in their interiors. All are low, the highest point of each—the beach-crest—standing as a rule only 8 to 10 feet above mean tide, with some dunes as high as 25 feet. The temperature of all is very uniform, but the rainfall is highly variable. In the first half of the year the north-east trade winds bring the rainy season, while precipitation is scanty during the prevalence of the south-east trades in the other half. This periodicity may however be interrupted by rain-bringing west winds. The dryness of some of the islands is partly due to the column of heated air which rises from the burning coral sands, reducing the relative humidity, so that no rain may fall on the islands when precipitation is taking place over the adjacent ocean.

The differences in the rainfall are reflected in those of the vegetation. The wettest of all is Washington, with a relative humidity little below that over the surrounding ocean; here the outer belt, with a dark, almost peaty soil

composed of organic matter, supports a luxuriant coco-nut forest, which retards evaporation, and thus increases the humidity to which the production of the forest must originally have been due. The central zone of lake and peat-bog is also an indication of a moist climate, though presenting the strongest possible contrast to the forest border. This last seems of great age, and both living and dead trunks of the palms are profusely covered with bird's-nest ferns (*Asplenium nidus*). On the beach-crest itself a narrow belt of *Tournefortia argentea* fringes the forest externally. Palmyra and Fanning have a vegetation only slightly less luxuriant, groves of *Pisonia grandis* being associated with the coco-nuts. Christmas Island occupies an intermediate position. Here most of the coco-nuts appear to have been introduced, the only natural forest association being that of *Tournefortia argentea*—here again a typical beach-tree, but in places inland associated with a scrub of *Sida fallax*. The soil in this island is generally a light greyish or reddish-brown calcareous sand, with some organic matter. Jarvis has no trees at all, while even the herbs and shrubs are in a partly dried-up condition; and things are not much better on Baker and Howland. The total flora of all the islands is composed of only sixty species (of forty-eight genera), most of widespread occurrence.

LAKE-SEDIMENTS AND TEMPERATURE-DISTRIBUTION

The great contrasts between the types of sediment found in different lakes and in adjacent parts of the same lake result from the interplay of various factors, of which some are well known, others little understood or neglected, and some still unknown. One of the neglected factors in sedimentation is thermal stratification of the water, and this is discussed in a paper by E. M. Kindle entitled "The Rôle of Thermal Stratification in Lacustrine Sedimentation," which has appeared in the *Transactions of the Royal Society of Canada*, Sect. IV. vol. 21, 1927. Thermal stratification is a summer condition of most lakes, checking general circulation by dividing the water into an upper warm zone (epilimnion), a lower cold zone (hypolimnion), and an intermediate zone (thermocline) of rapid vertical temperature gradient. The thermocline is of great importance in the biochemistry of lakes, marking a discontinuity not only in temperatures but also in chemical composition. The effect of the thermal stratification of the water during summer on sedimentation is seen in different ways. Firstly, stratification controls the character of such biochemical changes in the sediments as depend on temperature; secondly, it delays the settlement to the bottom of very fine sediments and colloidal material, promoting their slow sorting out; thirdly, it acts chemically in that the epilimnion is frequently alkaline, and the hypolimnion acid; and the biochemical products and resulting sediments differ accordingly. Thus the water in the epilimnion may be saturated with respect to carbonate of lime, and deposits of marl may be forming on the bottom within the limits of the epilimnion zone, whilst in the deeper water the acidity may suffice to dissolve shells or other calcareous matter falling into it. Many lake plants show a stratification largely dependent upon that of the water. The abundant blue-green alga *Anabæna*, for example, is confined to the upper 15 feet of lake water. Of several small Canadian lakes investigated by Mr. Kindle in the Ottawa river valley, only one, Lake Deschenes, showed no thermal stratification, the uniform temperature from surface to bottom being accounted for by the mixing of river water passing through the lake at Chat Falls a few miles above its head. In McKay and other lakes the heat of summer was found to have had practically no effect at all on the hypolimnion, where a temperature but little above the freezing-point prevails throughout the year. All those lakes, of course, are ice-bound in winter.

DANISH OCEANOGRAPHICAL EXPEDITION

A Danish oceanographical expedition on the *Dana* left Copenhagen in June on a two years' cruise round the world *viâ* the Panama Canal, the East Indian Archipelago, and the Red Sea. The expedition is being financed from the Carlsberg Fund, and the Danish Government has provided the *Dana*, fully equipped. Professor J. Schmidt, the Director of the Carlsberg Laboratory, is the leader, and his companions include Dr. Jespersen, a zoologist; Dr. Mortensen; Dr. J. N. Nielsen, of the Meteorological Institute; and Professor O. Paulsen, a botanist. They hope to establish a line of stations for deep-sea soundings (for which they are equipped with echo-sounding apparatus), and hydrographic investigations across the oceans. An attempt will be made to throw light on deep-sea currents by studying the distribution of salts and gases at various depths. Professor Schmidt will also complete in the South Pacific and Indian Oceans his studies of the migration of the eel.

THE SOUTH SWEDISH GEOGRAPHICAL SOCIETY

Since its foundation in 1925, the South Swedish Geographical Society has published an *Årsbok* which contains some interesting matter both on local geography and subjects of wider scope. In the issue for 1927 it is announced that the publication will be known in future as *Svensk Geografisk Årsbok*. This number contains a dozen papers of varied interest, including physical and human geography, historical cartography and geographical education. Each paper is illustrated and has a summary in another European language. H. Richter discusses the oldest printed map of Scania, contained in Jansson's atlas of 1646, and traces it to an anonymous manuscript map in the Survey Office at Stockholm probably produced during the years 1617–44. The latter map was revised by O. Örnehufoud (who under the name of Olaus Johannes Gothus made several maps of Brandenburg), and finally published by the antiquarian, O. Worm. A description of the striking landscape of the marginal delta at Bredåkra, a relic of the retreat of the ice, is given by O. Andersson. There is also a bibliography of all Swedish geographical work published in 1926.

OBITUARY

Professor JIŘÍ DANEŠ

We record with regret the death last April of Professor J. V. Daneš, the distinguished Czechoslovak geographer, in a motor accident at Los Angeles. Professor Daneš was born near Unhošt, Central Bohemia, in 1880. While still a student at Prague he journeyed extensively through Europe, especially in the Balkans. There he made the acquaintance of Professor Cvijič, whose interest in geomorphological problems he shared. Later, when Professor of Geography at the Charles University, Prague, Daneš travelled farther afield, to the United States, Central America, Java, and Australia. After the war, he went to Sydney as Consul-General for Czechoslovakia, and continued his geographical studies in his leisure hours, taking the opportunity to return home through Polynesia, China, Japan, and Canada. At the time of his death he was lecturing in American Universities, and studying Karst phenomena. Professor Daneš had written widely on various branches of geography, physical, economic, and political. He had also worked to promote cordial relations between Czechoslovakia and this country, being an active member of the British-Czechoslovak Society of Prague. Among his numerous foreign

distinctions, he was a Corresponding Member of the Royal Society of Queensland and of the Royal Geographical Society of Australasia, and a member of the "Commission internationale de l'Atlas photographique des Formes du Relief terrestre."

Mr. JAMES WHITE

By the much-regretted death, on February 26 last, of Mr. James White, Technical Adviser to the Ministry of Justice at Ottawa, geography in Canada has suffered a severe loss. Mr. White was born at Ingersoll, Ontario, on 3 February 1863. On leaving the Royal Military College, Kingston, he entered the Geological Survey as a draughtsman, and during his official career held responsible posts in that service and in the Department of the Interior. Appreciative reference to Mr. White's varied activities was made by our President in his recent Anniversary Address, which will be published in the August *Journal*. Mr. White was elected a Fellow of the Society in 1900.

MEETINGS: SESSION 1927–28

Fourteenth Evening Meeting, 21 May 1928. The President in the Chair

Elections: Arthur E. Beck; Capt. A. E. Bedworth; Nibaran Chandra Ray Chowdhury, B.A., B.T.; Thomas Conolly; Aubrey Louis Ernest Dennis; Francis Henry Symons Grant; The Lady Grimthorpe; The Rev. G. Frank Howlett; Alfred F. Lichtenstein; Mrs. A. K. Loyd; Dr. John Frederick Southward; The Hon. Alexander W. Weddell

Paper: A Journey in Liberia and the Eastern Congo. By Dr. J. C. Shattuck

Fifteenth Evening Meeting, 4 June 1928. The President in the Chair

Elections: Edward Boore, B.SC.; Esteban Lucas Bridges; George Gerard Brinsley; John E. Butt; Dr. Robert Coleman; The Rev. Thomas Cook; Arthur Barnard Cowtan, O.B.E.; Reginald Ernest Costigan; Bertram Arthur Dalton; Rafael de Nogales; Major J. R. Ellison, R.A.V.C.; H. Goodwin; Major Edwin Lewes Gower, R.A.F.; Mrs. Olive Grey, F.Z.S., F.E.S.; H. de Courcy Harston; Mrs. A. Margaret R. Hewitt; J. H. Iliffe, M.A.; Mrs. Maitland Kirwan; William Norman Ling; Major Charles Lionel Grey Matthews-Donaldson; Mrs. Alfred Morris; W. A. Don Munday; Capt. K. M. Papworth, M.C., R.E.; The Rev. A. Austin Phillips; Leonard Montague Pink; Bernard George Radley; The Rev Joshua Robertson, M.A.; Derrick Seebohm; The Rev. W. F. Smalley; Major-General Ivor Thord-Gray; George Roland Harding Webster

Paper: Pre-Ghal in Waziristan. By Capt. W. R. Hay